Heating Piping & Air Conditioning

DECEMBER 1956

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INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

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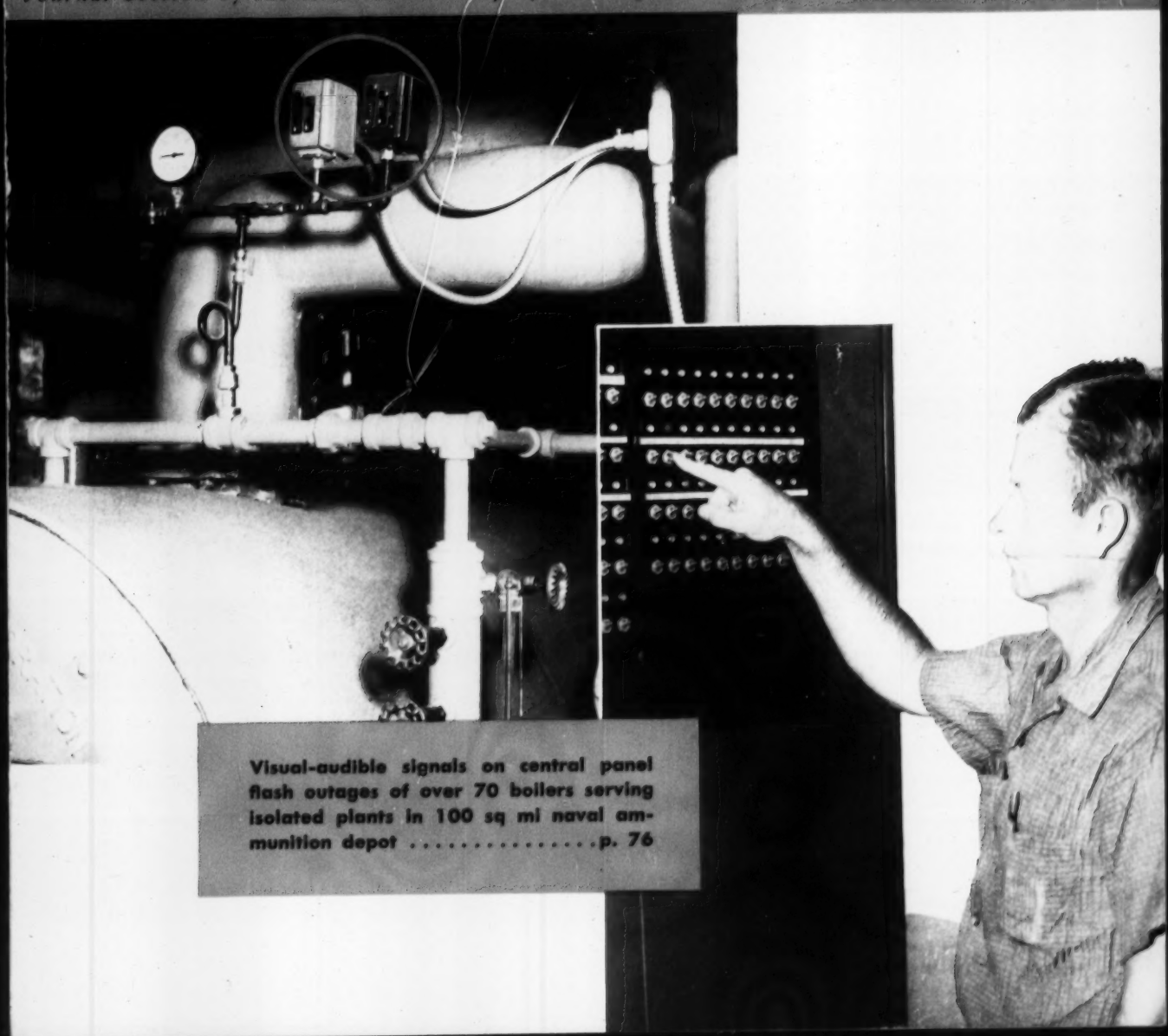


Visual-audible signals on central panel flash outages of over 70 boilers serving isolated plants in 100 sq mi naval ammunition depot .....p. 76

How GRINNELL insures the accuracy of its pipe fittings

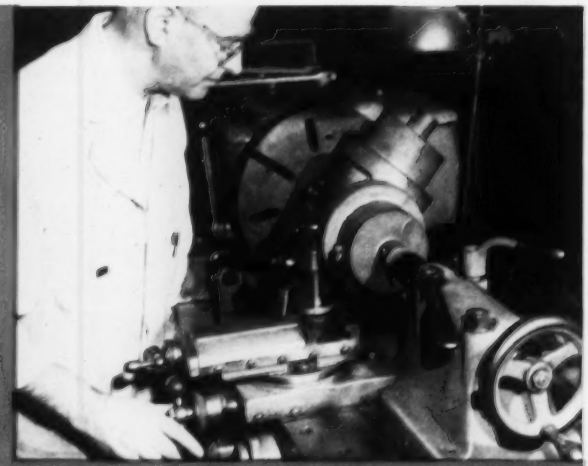
The accuracy and uniformity that is built into Grinnell pipe fittings starts at the pattern shop. Here, pattern makers, highly skilled from many years of experience with Grinnell products, painstakingly machine the pattern models — the first step in producing a top quality fitting.

These craftsmen also make the precision core box to the same exacting tolerances as the pattern. Perfectly matched to each other, the core made from the core box and the mold made from the pattern produce the exceptionally accurate casting.

Special machines, designed and custom-built by Grinnell engineers and tool room experts, complete the machining of the Grinnell fitting.

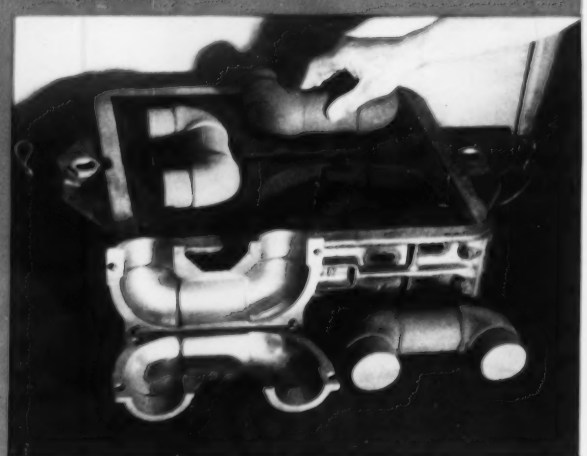
Other outstanding features of Grinnell fittings include: high quality metal; smooth surfaces inside and out; proper chamfer for easy starting and protection of first thread; precision threads for easy running up and tight joints; exact angles; and tested strength. Order a supply from your local Grinnell Distributor.

GRINNELL
WHENEVER PIPING IS INVOLVED



One of Grinnell's highly skilled pattern makers machines the model for a 90° elbow.

Shown here is a multiple mold for 90° elbows which has been made from the pattern above it.



In the foreground is the precision core-box and core made in it. In the background, cores are being placed in the mold.

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

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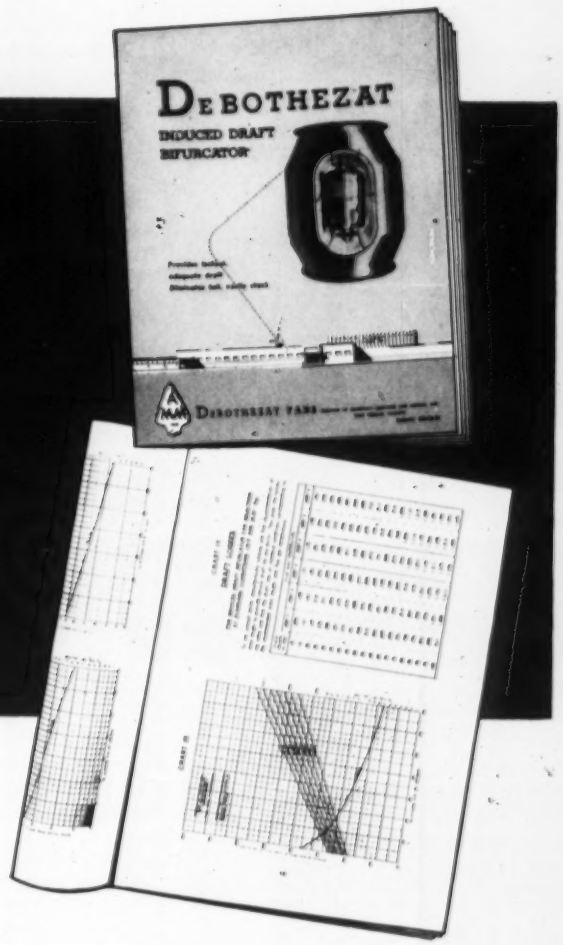

all boiler code ratings expressed in BTU/HR

A valuable working tool for both the engineer and contractor. This new 20-page catalog gives all manufacturers' organizations boiler code ratings reduced to their common relationship of BTU/HR delivered to the steam.

Also included are useful tables and charts on volume of flue gas for oil, gas and coal. Facts are given on the selection, use and installation of Induced Draft Bifurcator Fans. Performance data and complete specifications on all DeBothezat Induced Draft Bifurcators are outlined in detail.

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A DIVISION OF
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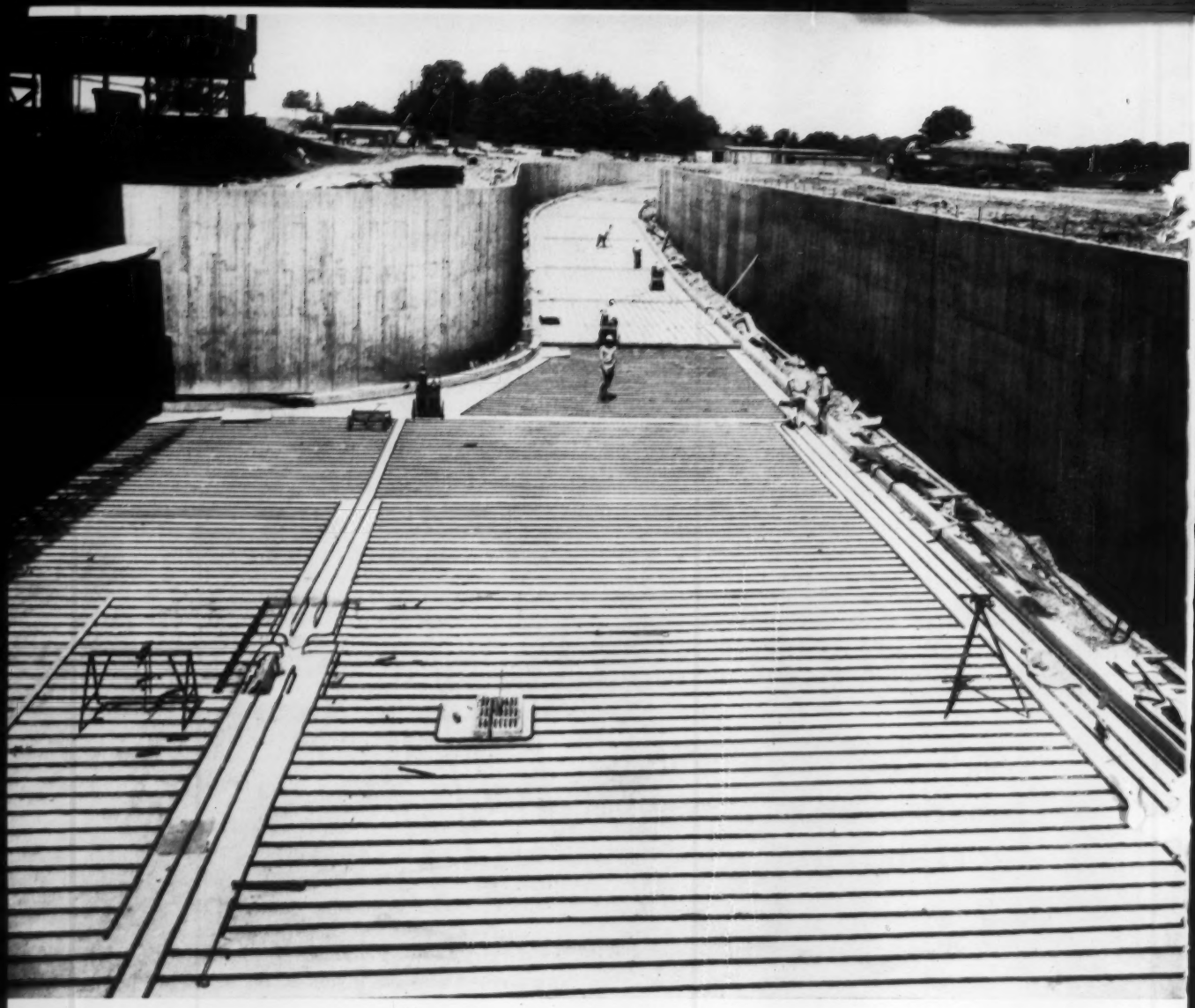

Built-in snow removal called for piping dependability —they used Wrought Iron

Not just snow melting—but *dependable* snow melting—was the leading design objective for this access ramp.

That's why designers of the new Connecticut General Life Insurance Company office building gave such careful consideration to material selection for this access ramp. Four major factors supported the use of wrought iron for this job: its corrosion-resistance—rugged strength—low coefficient of expansion with concrete—ease of fabrication.

In addition to snow melting service, wrought iron pipe was also installed for well water and cold water lines, chilled water mains, and well water piping in the heating and cooling system. Our booklet, "Byers Wrought Iron for Snow Melting Systems," offers case-history support for wrought iron's reliability in this service. Write for a copy.

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Heating Piping & Air Conditioning

Vol. 28 No. 12

DECEMBER 1956

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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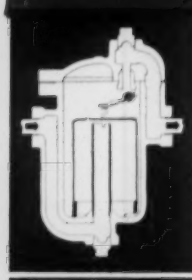
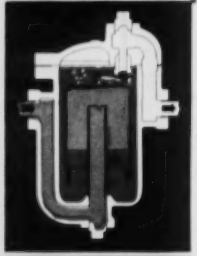
How Armstrong Trap Design Improves Plant Efficiency . . .

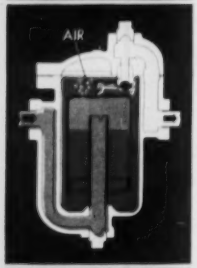


1 When trap is first installed, the inverted bucket is down and the valve is wide open. The large clearance between valve and seat minimizes restriction to condensate flow, contributing to large capacity.

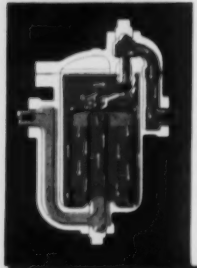
2 When steam is turned on, note how condensate (solid color) flows down between bucket and trap body, then up and out through orifice. Dirt is held in suspension and washed out when valve opens.



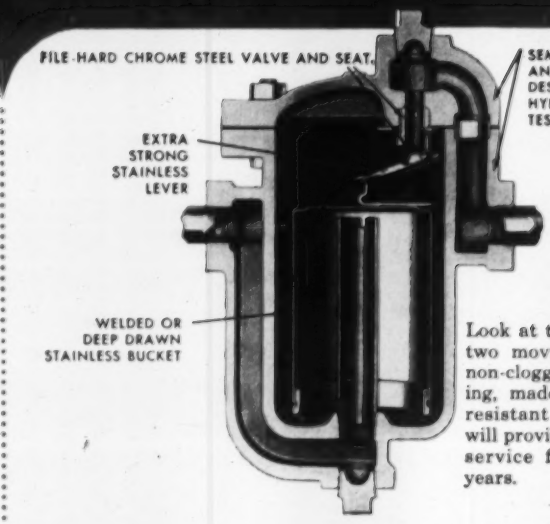
3 When steam reaching trap displaces less than ⅔ of the water in the bucket, it floats, closing the valve. Generous safety margin (dimension A) insures that steam will never reach trap orifice.



4 When more condensate enters trap, the bucket loses buoyancy and pulls on valve lever. (Note how incoming air passes through bucket vent and collects at top of trap, awaiting discharge.)



5 When weight of bucket times leverage overcomes pressure on valve, trap opens, creating momentary pressure drop that "pumps" condensate and non-condensibles from unit being drained.


PILE-HARD CHROME STEEL VALVE AND SEAT
SEMI-STEEL BODY AND CAP. 250 LBS. DESIGN PRESSURE—HYDROSTATIC TESTED AT 500 LBS.
EXTRA STRONG STAINLESS LEVER
WELDED OR DEEP DRAWN STAINLESS BUCKET

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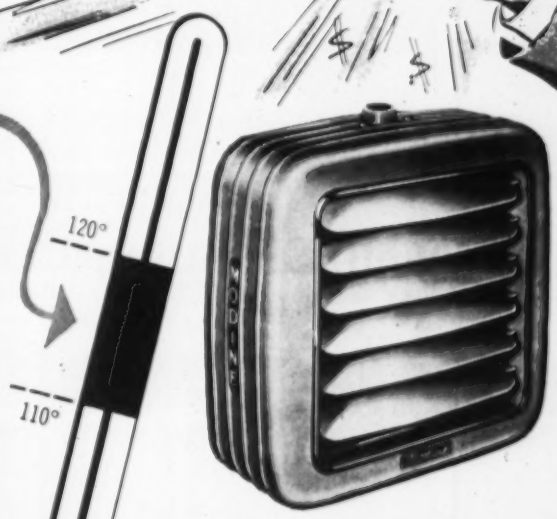

Horizontal delivery type, direct pipe-suspended, can be installed as recessed or fully concealed unit.

Modine horizontal unit heaters

Built for steam and hot water service, units are available in blow-through and draw-through types . . . in 36 different capacities.

For drying and processing applications, hot water units with higher fin-to-tube ratios may be operated on steam.

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Vertical delivery type. Light weight unit installs easier without special ceiling supports.

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SU-1322

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Gives you complete unit heater details. Write Modine Mfg. Co., DeKoven Ave., Racine, Wis.

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Comfort story of a modern restaurant

Honeywell Electronics makes operation of small-

Bob's No. 3 Restaurant, Glendale, Calif. Architect: S. David Underwood, A.I.A. Designer and contractor: Don C. Glenn Heating & Air Conditioning Co.

Attractive, modern—Bob's No. 5 Restaurant typifies the kind of short-occupancy space where the accuracy and fast response of Honeywell Electronic Temperature Control are ideal for keeping comfort constant. Here are other major advantages of the installation:

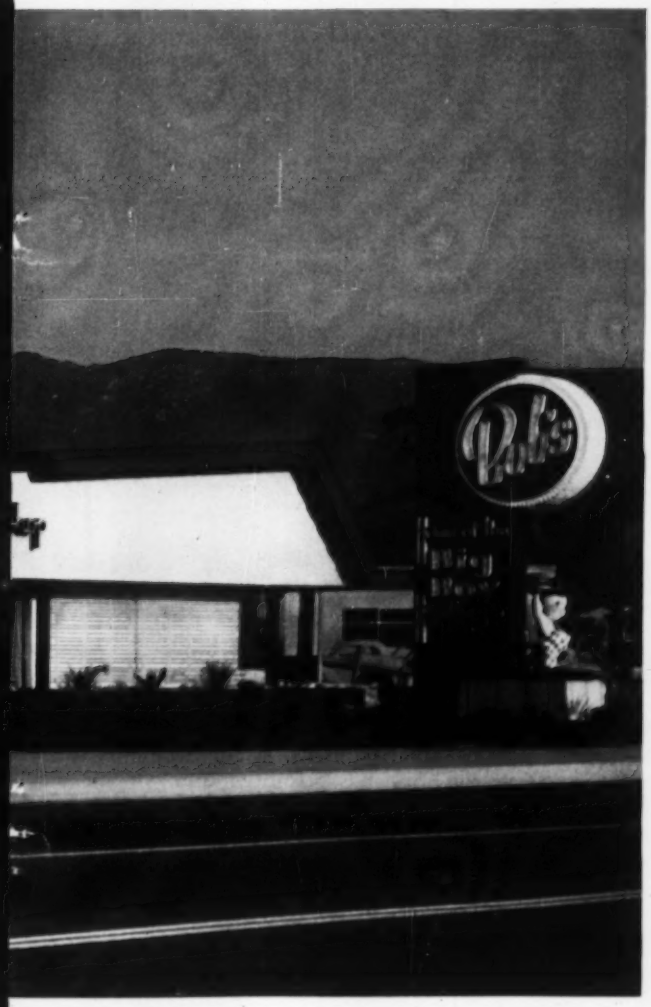
. . . ***automatic change-over*** from heating to ventilation to cooling, without attention.

. . . ***outdoor thermostat*** automatically adjusts indoor temperature according to the weather, winter and summer. Permits ideal comfort in mild weather, prevents unpleasant indoor chilling in hot weather.

. . . ***electronic control panel,*** conveniently located, gives restaurant manager full control of temperatures and avoids tampering.

. . . ***automatic use*** of outside air for cooling whenever conditions permit lowers cost of mechanical refrigeration and gives free cooling during mild weather, or occasional unseasonably winter warm spells.

system air conditioning fully automatic



Now smaller jobs can have big-system flexibility, convenience, operating efficiency at reasonable cost—with Honeywell Electronic Temperature Control

IN SMALL air conditioning systems, as in the largest, good control is essential to good performance.

Good control means fully *automatic* control—until recently limited mostly to systems in larger buildings. The small job simply couldn't justify the expense of a completely automatic conventional control installation.

That's no longer true, thanks to Honeywell Electronic Temperature Control. Now it's possible for buildings like this smart new restaurant in Glendale, Calif., to have the *best* control—and therefore ideal air conditioning performance—at a sensible price.

Honeywell Electronics gives the restaurant management the convenience, economy and comfort of a fully automatic, year-round heating and cooling plant. The features that make such benefits possible are explained in the picture caption above.

There are many ways Honeywell Electronics can help you give your clients unprecedented advantages—in heating, ventilating, air conditioning and industrial control, in any building, new or existing.

Call your Honeywell office for the new booklet that tells more fully how to apply electronics to your clients' control problems—and for information on the economical Honeywell Periodic Maintenance Plan. Or write Honeywell, Dept. HA-12-151, Minneapolis 8, Minn.

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Electronic Controls

For further information about Honeywell products, check the heating and air conditioning section 29 c/Mc of Sweet's Catalog

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In the interest of helping to standardize refrigerant terminology and nomenclature, General Chemical is adopting the revised code numbers shown above for its "Genetron" Super-Dry Refrigerants, effective January 1, 1957.

These numerical designations reflect recommendations of trade and technical associations throughout the industry which have been working jointly and independently on many standardizations, including a common numerical code system for fluorinated hydrocarbon refrigerants.

The numerals for two of the most widely used "Genetrons"—"Genetron" 12 and "Genetron" 11—already conform and, accordingly, are not being changed.

Code Numbers

SUPER-DRY REFRIGERANTS

. . . in the interest of standardizing refrigerant terminology and nomenclature

PRESENT GENETRON CODE NUMBER	CODE NUMBER TO BE USED EFFECTIVE JAN. 1	COLOR-CODE	REFRIGERANTS
genetron 11	**11**	ORANGE LABEL	**TRICHLOROMONOFLUOROMETHANE**
genetron 12	**12**	WHITE LABEL	**DICHLORODIFLUOROMETHANE**
genetron 141	**22**	GREEN LABEL	**MONOCHLORODIFLUOROMETHANE**
genetron 226	**113**	PURPLE LABEL	**TRICHLOROTRIFLUOROETHANE**
genetron 320	**114A**	DARK BLUE LABEL	**DICHLOROTETRAFLUOROETHANE**

"Genetron" Super-Dry Refrigerants are stocked and recommended by America's leading air conditioning and refrigeration wholesalers. When ordering from them in the year ahead, please use these revised code numbers to designate the "Genetrons" you need.

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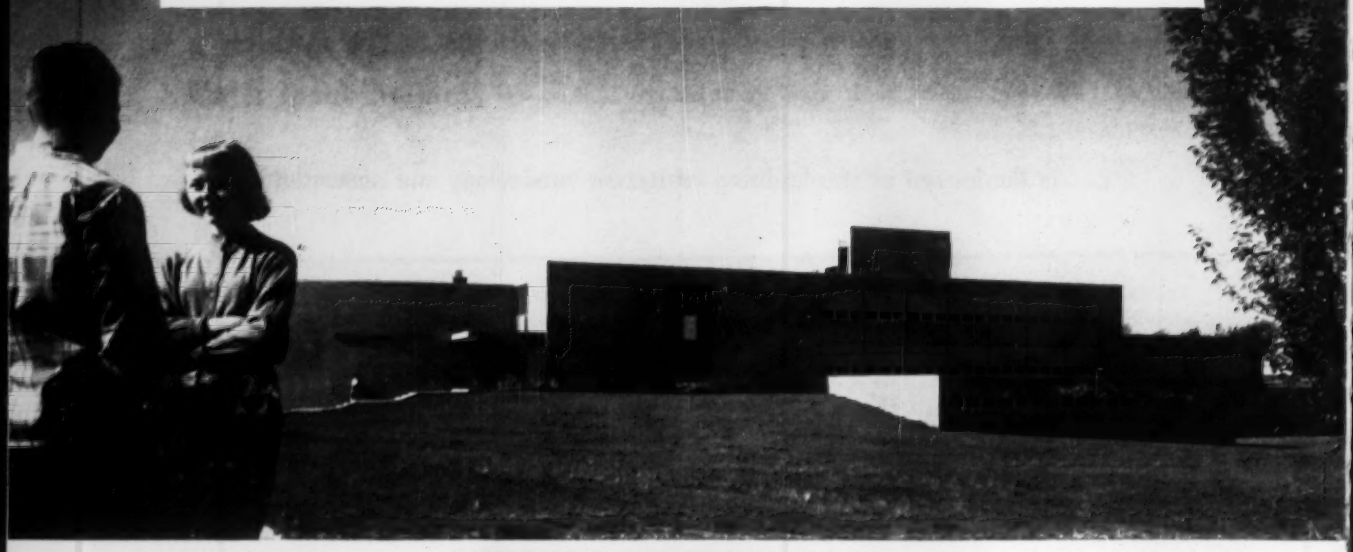
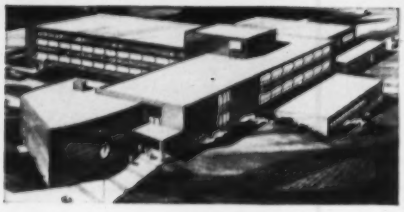
GET MORE COMFORT PER DOLLAR, SPEND LESS FOR HEATING





Increasingly high comfort standards, on the one hand, and pressure to reduce operating expenses, on the other, have centered interest on the importance of automatic temperature control. For both *comfort* and the *cost of comfort* in today's schools are determined largely by the efficiency of the control system.

In the impressive new Edison Junior High School* progressive school planners have demonstrated how it is easily possible to stress economy while making exceptionally complete provisions for student and teacher comfort. Some of the highlights of this up-to-the-minute comfort control system are shown by the accompanying photographs.

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*Edison Junior High School, Sioux Falls, South Dakota. Harold Spitznagel & Associates, architects, Sioux Falls; Homer Bird, mechanical engineer, Minneapolis; Carlson & Glasgow, mechanical contractors, Sioux Falls.

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UNIFORM AIR DISTRIBUTION is essential to consistent comfort. Opening and closing of dampers as air is discharged at various points throughout the building could result in too little ventilation in some rooms, too much in others. Here, behind the scenes, Johnson Static Pressure Regulators keep the entire ventilation system in perfect balance and insure even air distribution at all points.

OUTDOOR AIR FOR VENTILATION is admitted through the action of Johnson Dampers and Damper Operators. Air is heated only enough to offset the effects of outdoor temperatures. The temperature of the water supplied to the convector radiation is also controlled according to outdoor conditions. This weather-compensated primary control adds greatly to comfort while minimizing fuel consumption.

"MASSACHUSETTS goes

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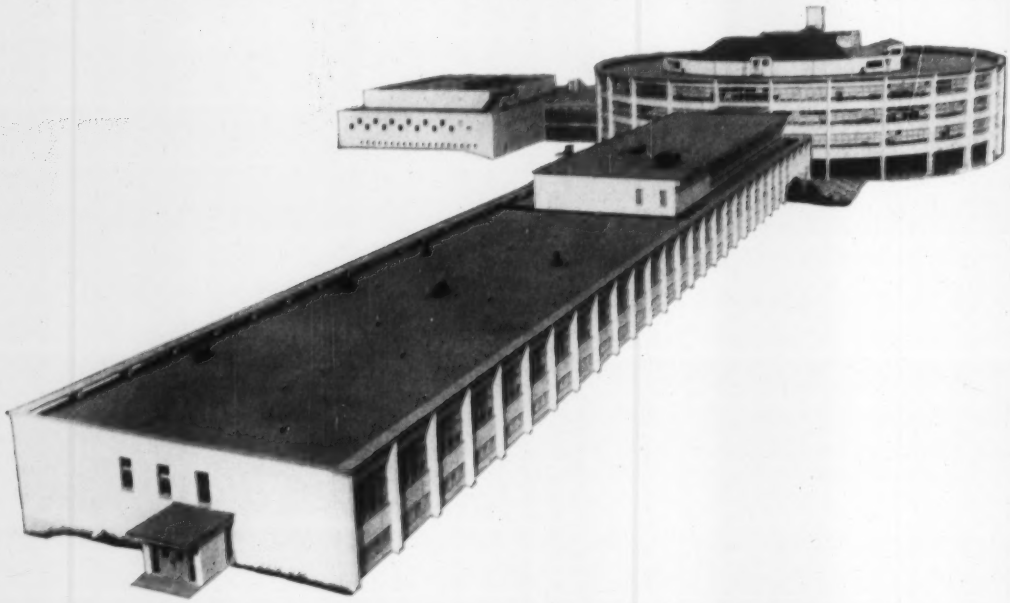

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"THE BANJO SCHOOL"

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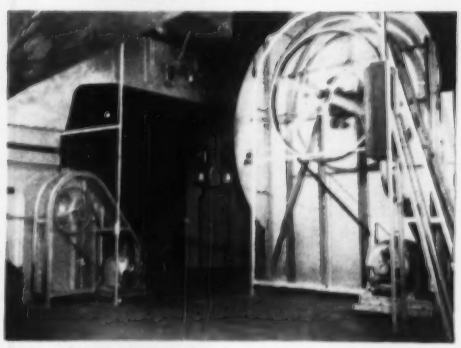

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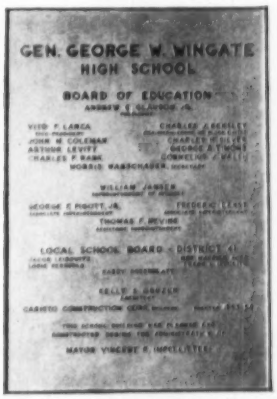
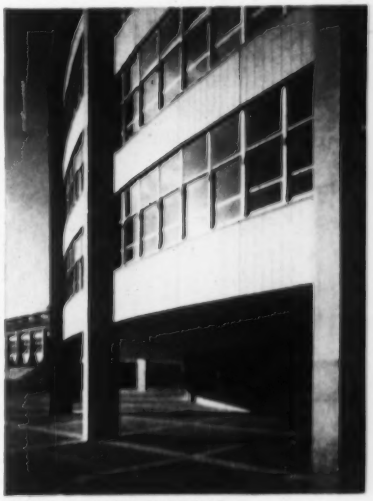
to school"

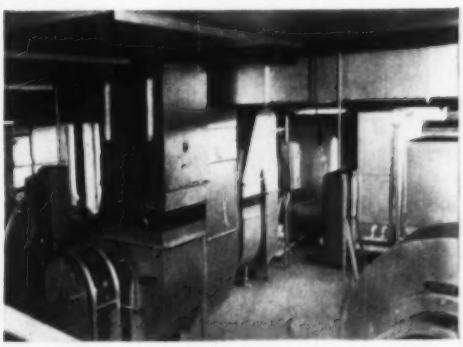
URBAN AREAS, HEATING AND VENTILATING CONTRACTORS INSTALLED QUANTITIES* . . . . . D. J. RICE, INC. 44 SCHOOLS; HARRY STARKMAN BROS. HEATING MAINTENANCE CORP. 6 SCHOOLS; NORMAN HEATING CO. 3 SCHOOLS; EDWARD B. KEARNEY & CO., INC. 2 SCHOOLS.



EDWARD B. KEARNEY CO., INC.
HEATING AND VENTILATING
CONTRACTORS



CLOSE UP VIEW SHOWING
SECTION OF "BANJO".



FANS FOR BOYS GYM AND
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(DUPLICATE INSTALLATION FOR GIRLS).

FANS FOR CLASS ROOMS.

* PARTIAL LIST

MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK Mfg. Co.
4907 HAMILTON AVENUE CLEVELAND 14, OHIO

Look for these labels soon!

Pennsalt Chemicals
THE KEY TO MODERN LIVING
ISOTRON
REFRIGERANT-11
TRICHLOROMONOFLUOROMETHANE
NON-FLAMMABLE • LIQUEFIED GAS UNDER PRESSURE
CYLINDER HANDLING AND STORAGE: Store out of sun and away from heat.
Keep valve tightly closed. Never drop or refill cylinders.
Return empty container to
PENNSYLVANIA SALT MANUFACTURING CO.
Calvert City, Ky.
THE KEY TO MODERN LIVING
ISOTRON
REFRIGERANT-12
DICHLORODIFLUOROMETHANE
NON-FLAMMABLE • LIQUEFIED GAS UNDER PRESSURE
CYLINDER HANDLING AND STORAGE: Store out of sun and away from heat.
Keep valve tightly closed. Never drop or refill cylinders.
RETURN EMPTY CONTAINER TO:
PENNSYLVANIA SALT MFG CO
CALVERT CITY, KY.

...on Pennsalt's new refrigerants

ISOTRON

THE KEY TO MODERN LIVING

Now—even before the complete line of ISOTRON* fluorinated refrigerants is ready—Pennsalt offers the much-needed "missing link" of individualized *service* and assistance to the air-conditioning and refrigeration design engineer, the wholesaler, and the service contractor.

A pioneer and leader in modern fluorine chemistry, Pennsalt stands squarely behind the new ISOTRON line. ISOTRON products are COMPLETELY INTERCHANGEABLE with other reputable fluorinated refrigerants. They're of precisely the same formulas as the other products of this kind, and will be manufactured in a modern new plant with the rigid quality control you expect of Pennsalt. ISOTRON refrigerants will be packed at the plant in all standard containers.

INVESTIGATE THE ISOTRON LINE! Benefit from Pennsalt's advanced thinking and welcome *service*, which will be available nationwide to refrigeration service contractors and wholesalers as well as to original-equipment manufacturers. For further information on ISOTRON refrigerants, write Isotron Chemicals Dept. 362, Industrial Division, Pennsylvania Salt Manufacturing Company, Three Penn Center Plaza, Philadelphia 2, Pa.

*ISOTRON IS A TRADEMARK OF THE PENNSYLVANIA SALT MFG. COMPANY

Pennsalt Chemicals

CONVENIENCE IN COPPER

The next time you order prime surface copper tube you can boost assembly line efficiency by specifying Wolverine long length coils.

Extra-long coils reduce stock chasing to a minimum, free valuable floor space for other duties, cut job make-ready time and help eliminate scrap.

☆ ☆ ☆

This is only one way in which Wolverine can contribute to your manufacturing efficiency. In addition to plain copper tube, you can increase heat transfer performance with Wolverine Trufin®—the integral finned condenser tube.

You can draw from Wolverine's complete fabrication facilities, its packaging program (designed to meet customer production line needs) and, of course, its Field Engineering Service—a staff of technicians ready at all times to help solve tubing problems.

At Wolverine this type of customer service is known as Tubemanship. It is based on years of metalworking experience, constant research, rigid quality control and sound engineering. For complete information about any of Wolverine's many products and services just pick from the booklets listed on the coupon below. Circle the one you need.

Please send me the following book or books:

- ☐ Commercial Tube Book
- ☐ Trufin Catalog
- ☐ Tubemanship Book
- ☐ Condenser Tube Catalog
- ☐ Fabricated Parts Book
- ☐ Spun End Book
- ☐ Refrigeration Catalog

NAME_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

Wolverine Trufin available in Canada through the Unifin Tube Company, London, Ontario

CALUMET & HECLA, INC.
CALUMET DIVISION
WOLVERINE TUBE DIVISION
FOREST INDUSTRIES DIVISION
GOODMAN LUMBER COMPANY
CALUMET & HECLA OF CANADA LIMITED
CANADA VULCANIZER AND EQUIPMENT COMPANY LIMITED

WOLVERINE TUBE

Division of Calumet & Hecla, Inc.

1461 CENTRAL AVENUE, DETROIT 9, MICH.

Manufacturers of Quality Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN
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SALES OFFICES
IN PRINCIPAL CITIES

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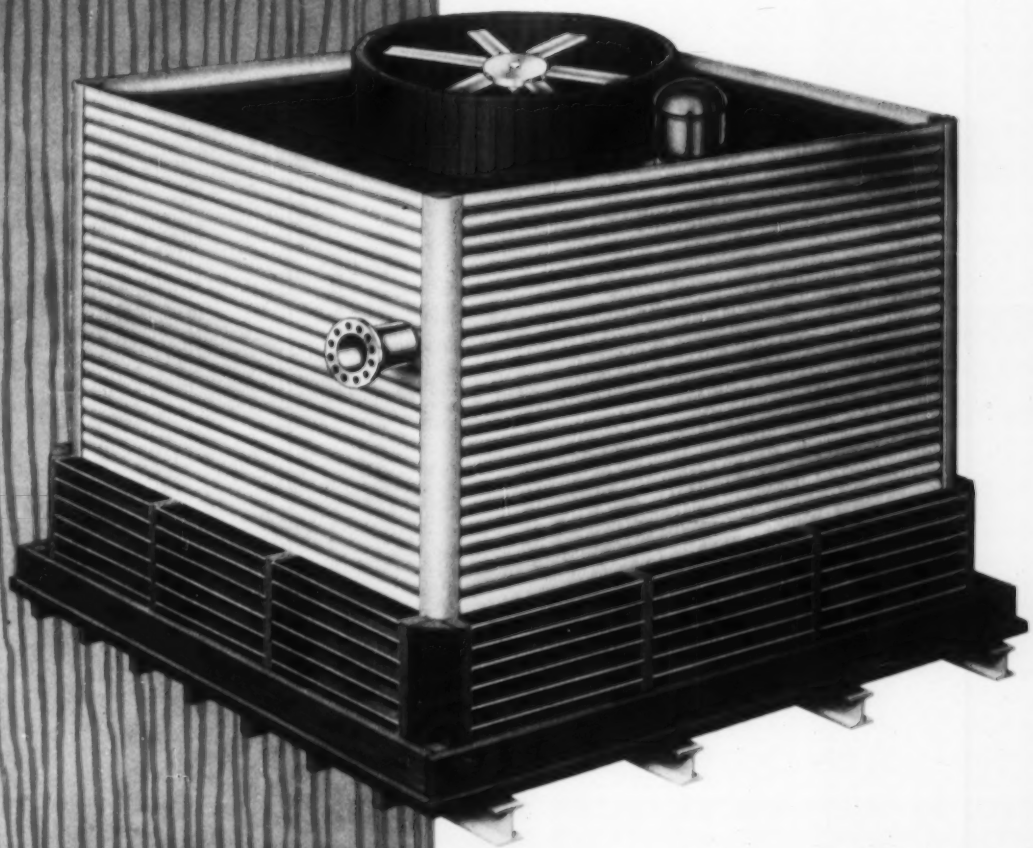
FLUOR *SERIES* 3



INDUCED DRAFT

fp

AIR CONDITIONING & REFRIGERATION

COOLING TOWERS

SERIES 3

The Series 3 cooling tower is designed specifically for central station air conditioning and refrigeration systems in commercial and industrial plants and buildings. It is furnished in a multiplicity of cell sizes to fit various space requirements.

Common single-cell sizes for installations ranging from 40 to 400 tons of refrigeration are 8′x8′, 8′x12′, 12′x8′, 12′x12′, 12′x16′, 16′x12′, 16′x16′, and 20′x20′. Combinations of these given cell sizes may be used to meet capacity requirements above 400 tons.

Architecturally, the Series 3 cooling tower offers a low profile with no orientation limitations. Structurally, its standard design meets all local and regional building codes. And, in dependable performance, the Series 3 is unexcelled, its basic concept having been proven in thousands of critical industrial installations.

COUNTERFLOW COOLING

The Counterflow principle (water and air moving counter-current to one another) is recognized and proven to be the most efficient method of cooling. Fluor's adaptation of tower-to-principle is evidenced by the high performance characteristics inherent in the Series 3.

EASE OF ERECTION

Accomplished in the Series 3 by simplicity of structural design and economy of prefabricated and preassembled parts. Erection can be made consistent with the timing of overall construction program with or without the services of a Fluor superintendent.

NO CORROSION MAINTENANCE

Low maintenance, noncorrosive features include heart or better redwood framing and filling; cement asbestos sheathing and louvers; enclosed redwood and stainless steel water distributing system; plastic, nonclogging spray nozzles; and, heavily galvanized motor and gear support.

NATIONWIDE SALES & SERVICE

Fluor Air Conditioning and Refrigeration Cooling Towers are available through exclusive representative companies in all major market areas. Experienced service and erection personnel are strategically located to render close customer contact when and where needed.

Outstanding design features for:

WATER

The Series 3 Fluor Cooling Tower features positive pressure-type water distribution as opposed to the open gravity type. Water to be cooled enters into a header and lateral system where it is sprayed uniformly over the filling below. As water falls to the tower-basin, it is repeatedly broken up by layers of filling of a predetermined film surface necessary to accomplish the cooling desired.

distributing system

Completely noncorrosive—header and laterals of redwood pipe banded with stainless steel—spray nozzles of nonferrous material. *Being enclosed, the distributing system remains algae free and assures clean, uniform water distribution over the entire cross sectional area of the tower—permits optimum performance, even with varying water rates!*

tower filling

Nailless filling consists of sturdy redwood battens placed on edge and interlocking, with each successive layer of battens mounted immediately above and at right angles to the layer below. *These film pack surfaces present ample redwood film areas to assure ideal water-air contact throughout all operating conditions.*

redwood basin

The Series 3 tower basin is of uniform quality, clear heart tongue and groove redwood, mastic sealed with wicking at all joints. Equipment furnished as standard includes: *silicon bronze nailing; galvanized steel sump; automatic water make-up valve; and, sump cleanout.*

AIR

In the counterflow tower, water remains in contact with the upward sweeping air until it falls into the basin. This long air-water contact effects maximum possible heat exchange. Design and arrangement of air moving and handling components in the Series 3 utilizes and complements this principle by assuring low pressure drop through louvers, uniform distribution of upward sweeping air, and high velocity discharge of exhaust air to virtually eliminate recirculation.

fan and motor

High tensile alloy metal fans are of the low r.p.m., high efficiency, adjustable pitch propeller type. Standard horizontal gear drive or vertical V-belt drive motors are furnished as specified. *Aerodynamic characteristics of fan design assure low sound level—unitized motor and fan support designed as a single operating unit to prevent misalignment of driving equipment.*

two-pass drift eliminator

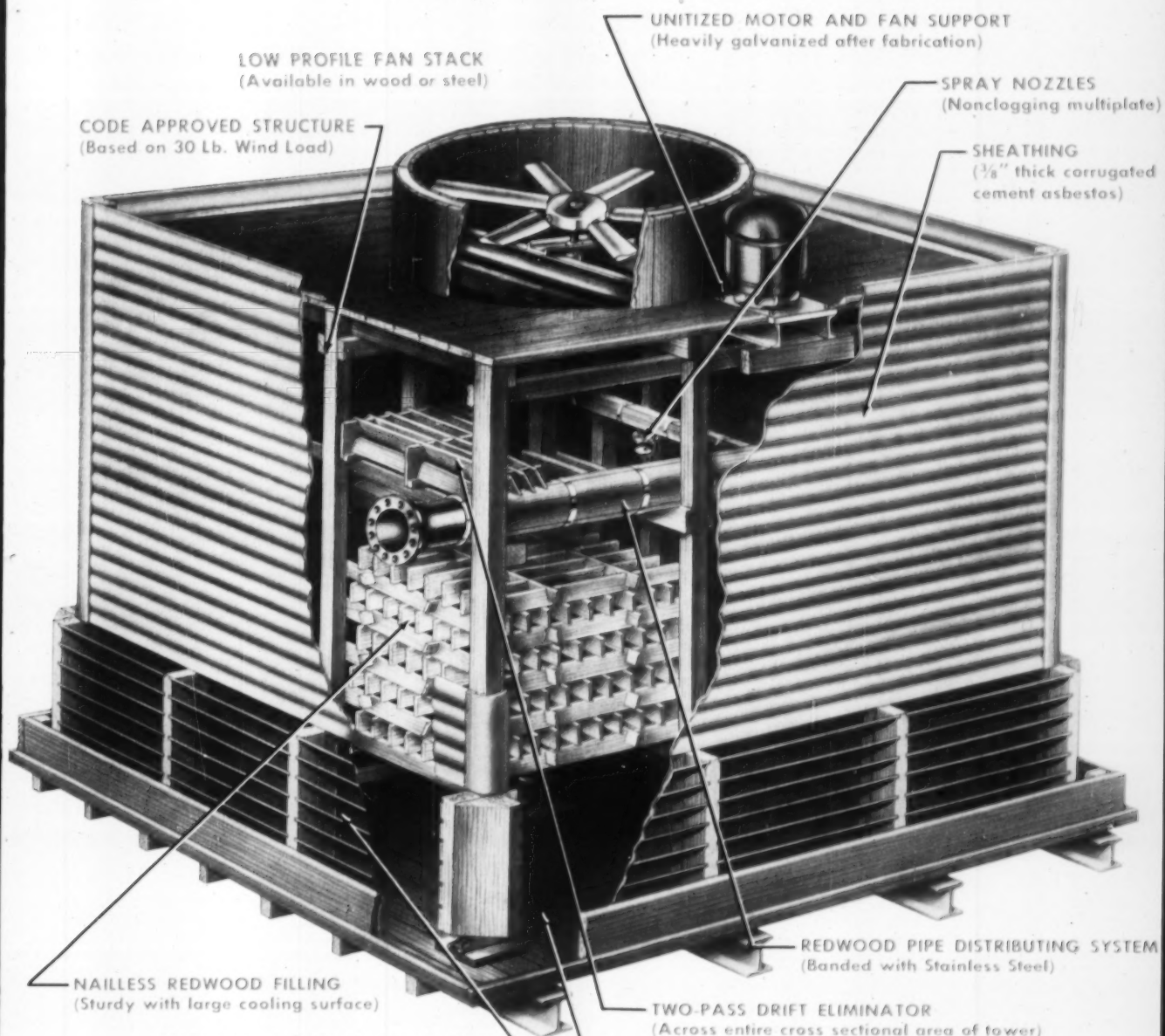
Drift eliminators are installed across the entire cross sectional area of the tower. Constructed in removable sections of heart redwood, each section consists of two layers of offset battens set at an angle to one another and firmly locked in position. *This Fluor design effects positive detrainment of water particles from the moving air without increasing pressure drop.*

air intake louvers

Louvers are located across the lower face of each side of the tower at an angle which assures smooth air flow. *Removable features permit access to tower basin from all sides—uniform appearance of all sides permits orientation consistent with architectural requirements.*

FLUOR

INDUCED DRAFT COOLING TOWERS


UNITIZED MOTOR AND FAN SUPPORT
(Heavily galvanized after fabrication)
LOW PROFILE FAN STACK
(Available in wood or steel)
SPRAY NOZZLES
(Nonclogging multiplate)
CODE APPROVED STRUCTURE
(Based on 30 Lb. Wind Load)
SHEATHING
(3/8" thick corrugated cement asbestos)
REDWOOD PIPE DISTRIBUTING SYSTEM
(Banded with Stainless Steel)
NAILLESS REDWOOD FILLING
(Sturdy with large cooling surface)
TWO-PASS DRIFT ELIMINATOR
(Across entire cross sectional area of tower)
REMOVABLE LOUVERS ON 4 SIDES
(Easy access for cleanout & inspection)
REDWOOD BASIN
(Clearheart tongue and groove redwood)

ACCESSORIES

standard accessories

1. Steel Ladder
2. Patented Fluor Vibration Cutout Switch
3. Galvanized Steel Basin Sump
4. Galvanized Steel Hardware
5. Automatic Water Control Valve
6. Sump Cleanout

optional accessories

1. Redwood Handrails
2. Steel Fan Guard
3. Nonferrous Hardware

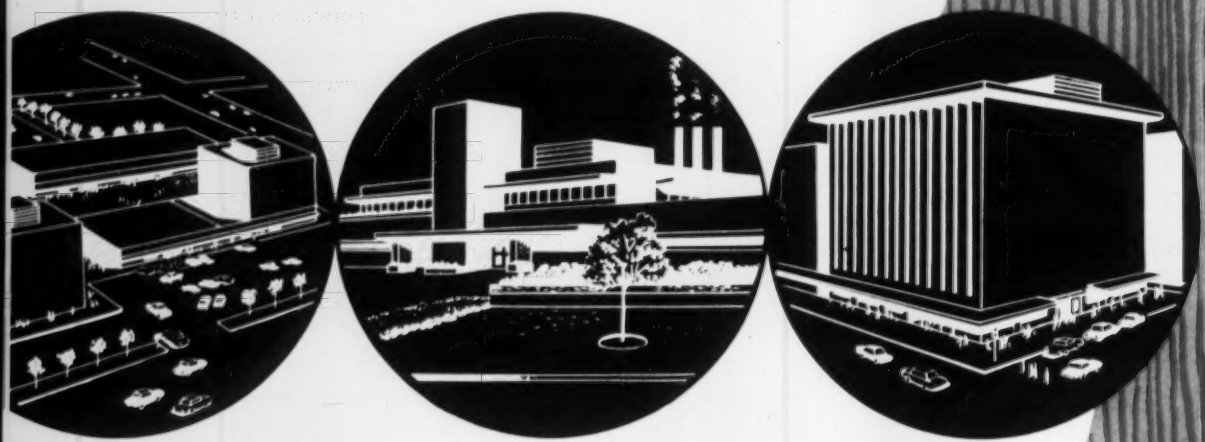
INDUCED DRAFT COOLING TOWERS

The Series 3 Induced Draft Cooling Tower is offered throughout the continental United States by the Air Conditioning and Refrigeration Cooling Tower Division of Fluor Products Company, one of the world's largest manufacturers of industrial cooling towers.

Fabrication of redwood structural components is on a mass production basis at the company's 155 acre mill in Santa Rosa, California. Design, research, development and engineering is centralized at the company's general and engineering offices in Whittier and Los Angeles, California.

The Series 3 Cooling Tower meets optimum architectural, operating and performance requirements of air conditioning and refrigeration service. It represents over thirty-five years accumulated experience in the engineering, fabrication and erection of cooling towers for virtually every industry utilizing water as a cooling medium.

In keeping with Fluor's long-standing reputation for quality, performance and appearance, special emphasis has been placed on the Series 3 to make it the best cooling tower available to the Air Conditioning and Refrigeration Industry.



SERIES 3 — ENGINEERING DATA

MODEL NO.	LENGTH	WIDTH	HEIGHT	PUMPING HEAD	H.P.	SHIPPING WT.
860	8′	8′	8′	8′5″	3	5540
875	12′	8′	8′	8′5″	5	7300
8125	12′	12′	8′	8′5″	7.5	7300
1060	8′	8′	10′	10′5″	3	6680
1075	12′	8′	10′	10′5″	3	8800
10100	12′	8′	10′	10′5″	5	8000
10125	12′	12′	10′	10′5″	7.5	11840
10150	12′	12′	10′	10′5″	7.5	11840
10175	16′	12′	10′	10′5″	7.5	11840
10200	16′	12′	10′	10′5″	10	14720
10300	16′	16′	10′	10′5″	15	18520

AIR CONDITIONING & REFRIGERATION COOLING TOWER DIVISION

FLUOR PRODUCTS COMPANY

A DIVISION OF THE FLUOR CORPORATION, LTD.

GENERAL OFFICES • WHITTIER, CALIFORNIA

BROCHURE NO. ACR-ID-0.350

PRINTED IN U.S.A.

TORRINGTON PRESENTS:

An important new line of complete blower units for central air conditioning, heating and ventilating, in a wide range of sizes, full and three-quarter widths, and incorporating the following exclusive Torrington features:

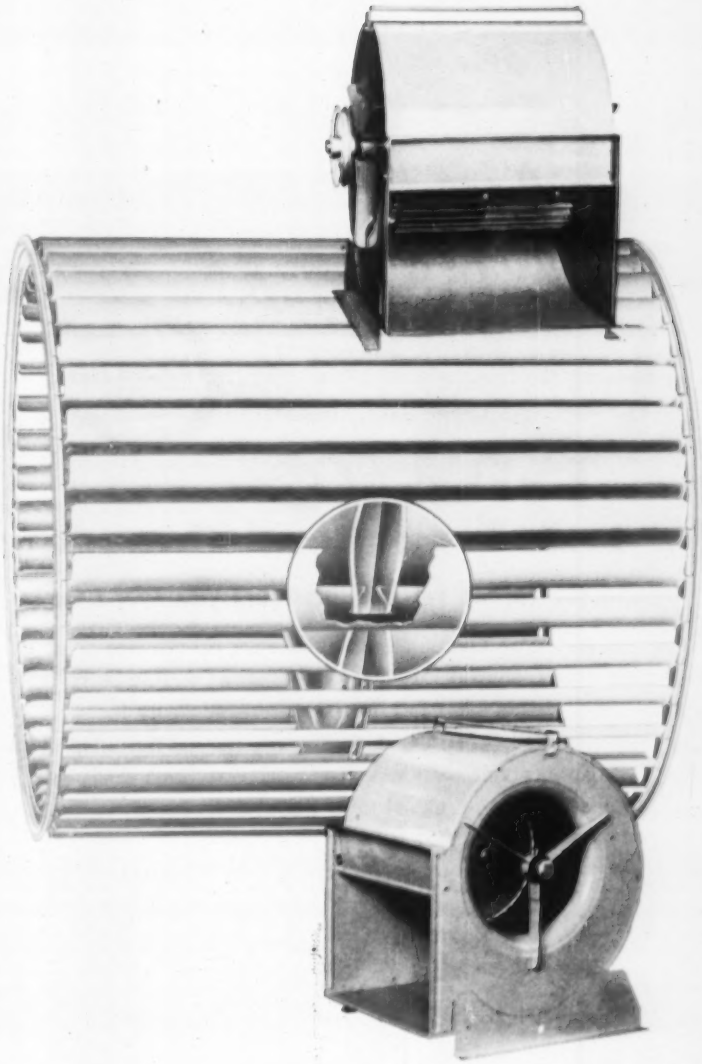
1. An exceptional new Center-Lock airotor introducing an entirely new principle of blower wheel construction in which (see insert) the center disc is dovetailed under pressure into the encircling blades. As a result of this design feature, the interlocking joint *tightens* under centrifugal force, eliminating blade rattle and angle warp at high speeds.

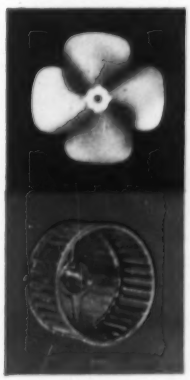
2. A Multi-Position blower housing, easily adaptable to left or right, up or down flow requirements, of the finest welded steel construction and special finish.

3. Availability in either belt-driven or direct drive assemblies.

4. Unit flexibility, providing feet, motor mounting assembly to meet your individual mounting requirements.

This new product line is a major development backed by all the standards of engineering quality consistent with Torrington leadership in the air impeller industry. Your inquiries are invited.





THE
TORRINGTON
MANUFACTURING COMPANY
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MEMO Tues. P.M.

Joe-
got a Rush Job-
order me full set of
those little Ridgid
drop-head dies I like-
Hank

Every RIDGID Pipe Tool TESTED individually before shipment

RIDGID 00R
⅛" to 1"

RIDGID 111R
⅛" to 1¼"

RIDGID 12R — ⅛" to 2"

RIDGID

⅛" to 2" Drop-Head Threaders

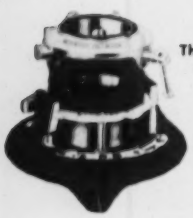
Handiest darned ratchet threaders you ever used!

Really handy, time savers, easy to use. Pick up the size head you need, snap it into the ratchet ring . . . and start threading! Heads can't fall out. Dies reverse easily for close-to-wall threading. Conduit and special dies available. Free carrier with sets. For perfect threads easily and long service, buy 'em at your Supply House.

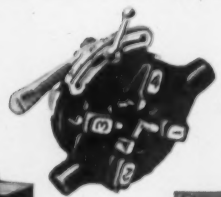
Carrier Free with Sets

Bolt Threaders, too— ask for RIDGID 00R-B, same easy-work advantages as drop-head pipe dies.

Whole Line of RIDGID Pipe Threaders Offers You Extra-Easy Threading



RIDGID
Jam-proof 65R
Threads 1" to 2" pipe with 1 set of dies.



RIDGID
504 Threader
for power drive use— threads 1" to 2" with 1 set of dies.

RIDGID
4P Geared Threader
2½" to 4" pipe— extra-easy handling, no upkeep.

RIDGIL
Top Quality Sulphur-Lard Thread-Cutting Oil

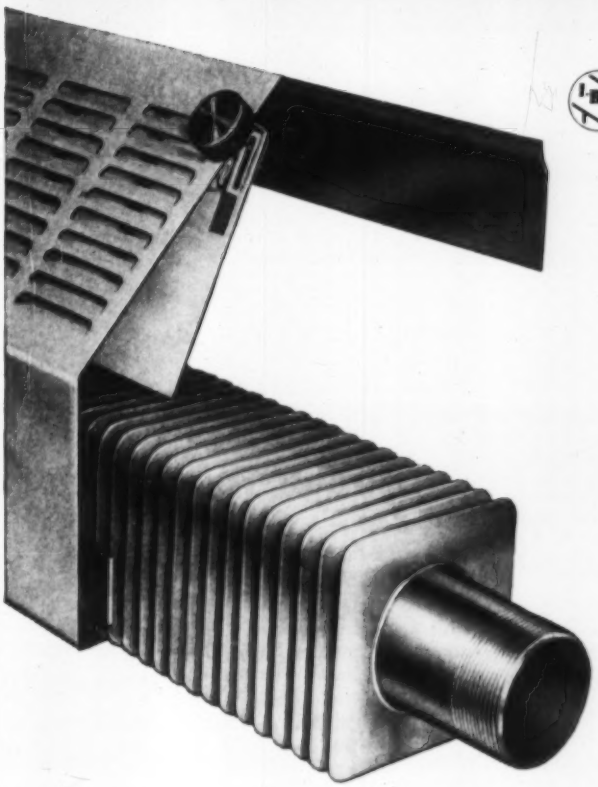
RIDGID
Work-Saver Pipe Tools

The Ridge Tool Company • Elyria, Ohio, U. S. A.

SARCOfin

When you buy or specify radiation

make sure you get all these advantages!



Sarcofin offers you:

APPROVED RATINGS—as established by Institute of Boiler and Radiator Manufacturers for finned-tube and baseboard radiation.

FULL GUARANTEE—top-quality Sarcofin products, backed up by a *1-year guarantee* against defects in materials and workmanship. Heating elements *guaranteed* for maximum working pressures.

COOPERATION—careful selection of radiation by experienced Sarco and Sarcotherm heating engineers.

UNDIVIDED RESPONSIBILITY—the protection and convenience assured by obtaining from *one* "Complete Line" source...SARCO-SARCOTHERM... not only Sarcofin finned-tube and baseboard radiation but also heating specialties for steam and hot water, condensation and vacuum pumps, temperature regulators, and weather-compensated control systems for steam and hot water heating.

SARCO COMPANY, INC.
SARCOTHERM CONTROLS, INC.
Empire State Building, New York 1, N. Y.

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Empire State Building, New York 1, N. Y.

Please send me:
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- ☐ Bulletin No. 1625 on Sarcofin Baseboard Radiation.
- ☐ Also information on_____

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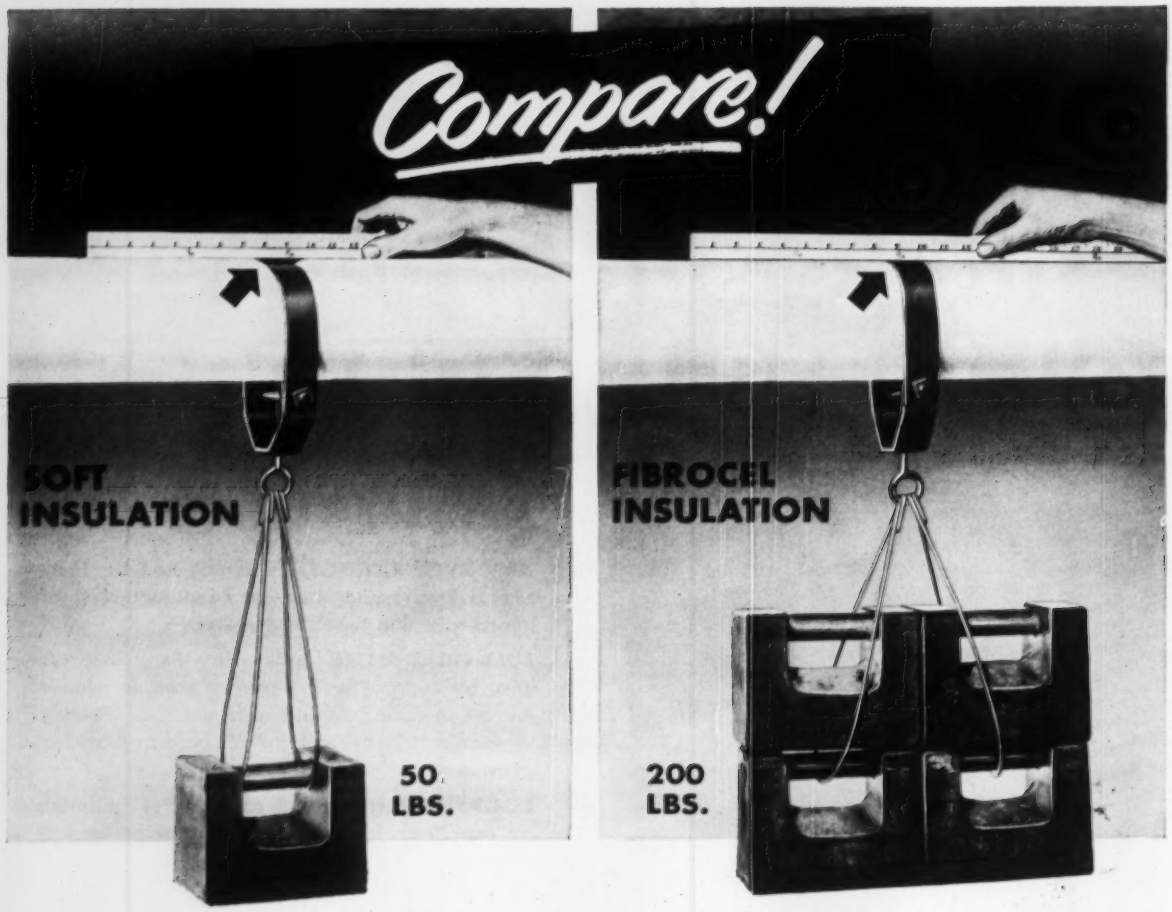


Compression test proves J-M Fibrocel® Insulation retains *FULL-WALL* thickness!

ONLY FIBROCEL OFFERS ALL THESE ADVANTAGES

No shrinkage—eliminates gaping joints. **Resists compression**—retains full-wall thickness. **Uniform dimensions**—precision formed for exact fit. **Economical application**—lightweight, easy to cut with a knife. **Thermally effective. Long lasting**—flame, rot, odor and vermin proof.

the new molded silica insulation developed for plumbing, heating, chilled water and dual service applications in the 35F to 300F temperature range

The illustrations tell you why Fibrocel maintains its insulating effectiveness . . . why it stands up under operating abuse which often impairs the performance of softer insulations.

At top left, a *single* 50-lb. weight noticeably crushes the soft ordinary insulation. But note that *four* of these same weights cause no deformation or compression in Fibrocel. *This means full insulating effectiveness!*

Fibrocel's added firmness and strength take on even more importance when a vapor seal jacket is involved. For Fibrocel offers substantially greater back-up protection against jacket punctures.

Fibrocel speeds installation, too! It is light in weight and a pleasure to apply. It cuts cleanly, easily with a knife. And its firmness and remarkable dimensional uniformity assure long-lasting, tight, smooth joints!

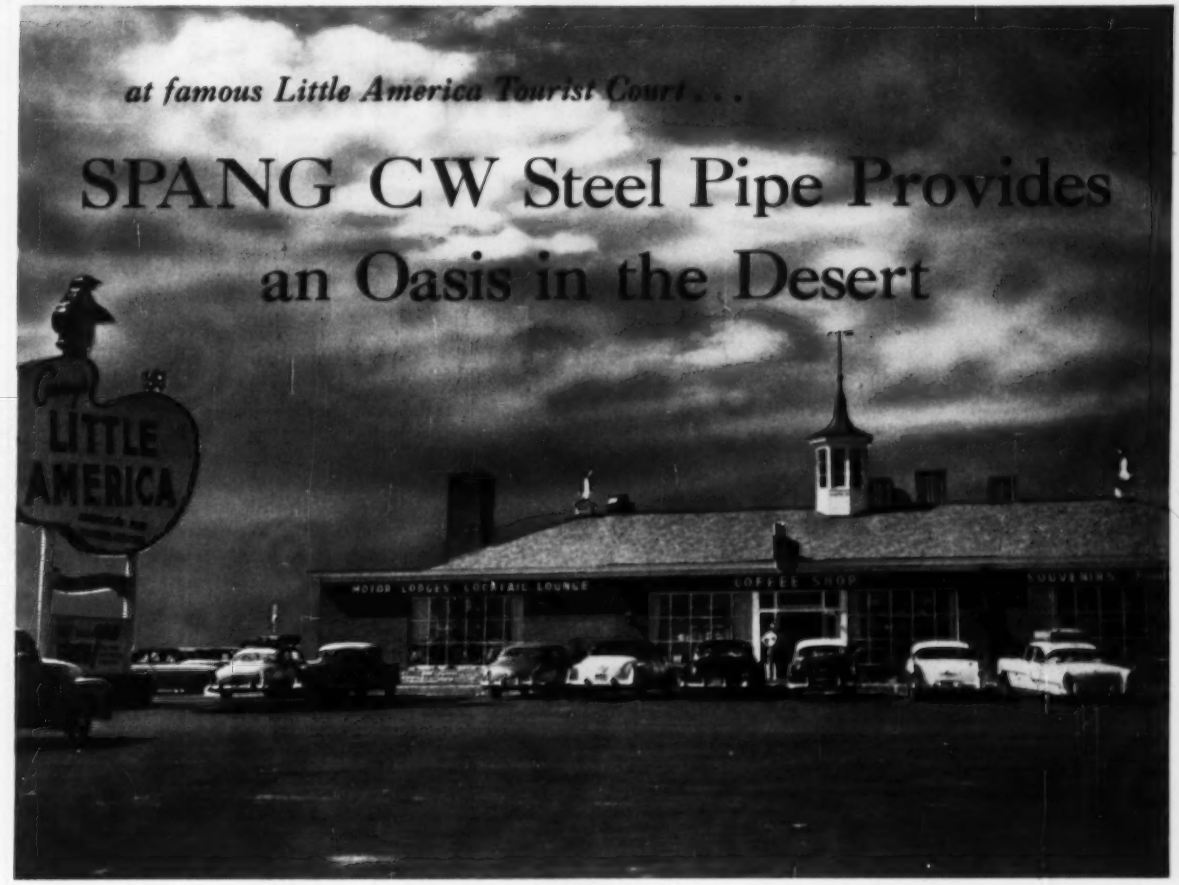
For further information on Fibrocel, write Johns-Manville, Box 14, New York 16, N. Y. (In Canada, Port Credit, Ontario.) Ask for brochure IN-155A.

Johns-Manville *first-in* INSULATION

MATERIALS · ENGINEERING · APPLICATION

at famous Little America Tourist Court . . .

SPANG CW Steel Pipe Provides an Oasis in the Desert



MAINTAINING a water supply in the desert is a tough job. But Little America Tourist Court in the heart of the Wyoming Desert reports that SPANG CW Steel Pipe has stood up under desert conditions better than any other pipe they have ever used.

Two miles of SPANG CW bring in 30,000 gallons of spring water daily to Little America's underground storage tanks for cooking and drinking uses. SPANG Pipe is also used for natural gas lines and the five-hydrant fire-fighting system on the 640-acre site.

Fred Mauch, Little America's chief maintenance man, says: "That SPANG water line is really holding up. SPANG Pipe has lasted better than any we have tried."

Earl Holding, manager of Little America, adds: "Our SPANG-piped fire system paid for itself. Savings on the first three-year premium paid for the entire cost of the pipe, pumps and hydrants. And the SPANG Pipe from the spring supply to the main installation has been trouble-free in five years of operation!"

This is *quality-controlled* SPANG CW Steel Pipe in action . . . typical of the service you get from SPANG in any type installation. Try it and see! Write for the name of your nearest SPANG Distributor.

Located in the middle of the Wyoming desert on US 30, Covey's Little America is a haven for travelers and truckers. It grew from a boy's dream to a self-sufficient tourist city of 30 buildings, including lodges, gift shops, service station, dining room, soda fountain and cocktail lounge.

General Contractor: Cannon Construction Co., Salt Lake City
Plumbing Contractor: Smithfield Plumbing Co., Salt Lake City
SPANG Distributor: National Supply Store, Rock Springs, Wyoming

SPANG Pipe supplies water, natural gas and fire protection at Little America, the world's largest one-stop travel center. All piping systems reach their main control areas through this underground tunnel.

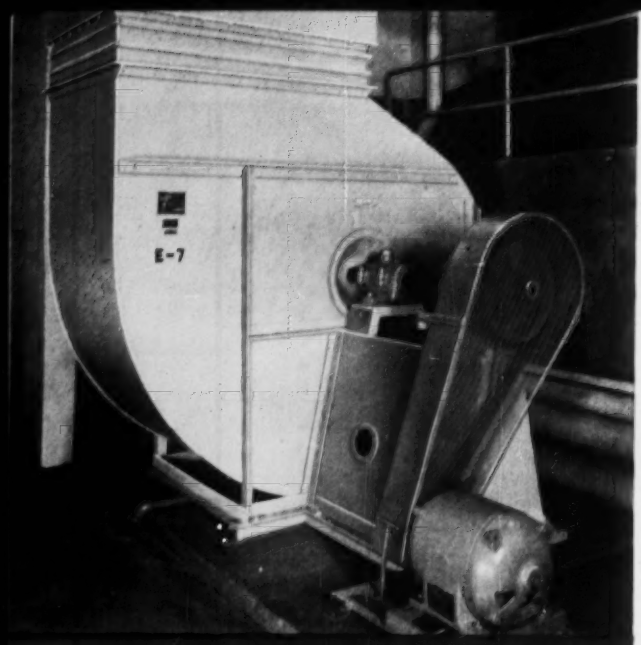
SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

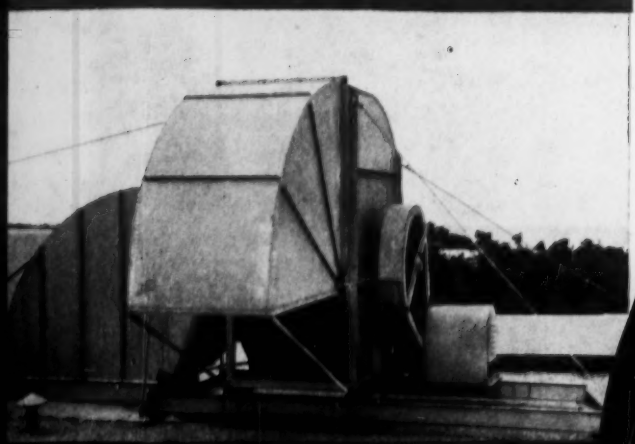
SPANG CW STEEL PIPE

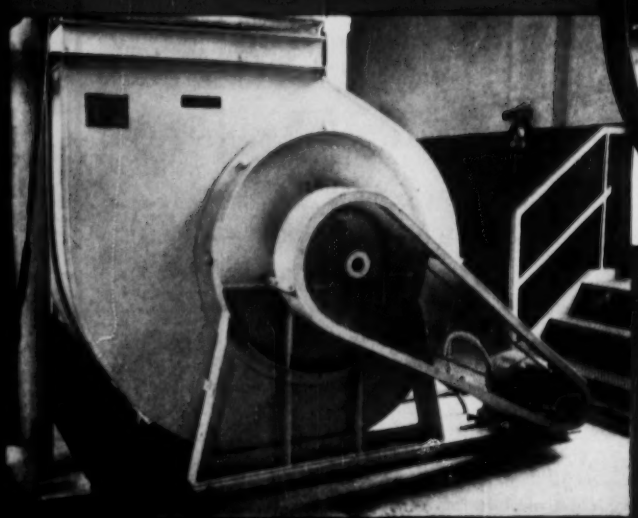
WHY "BUFFALO" BL FANS ARE USED FOR SO MANY OF THE BIGGEST JOBS

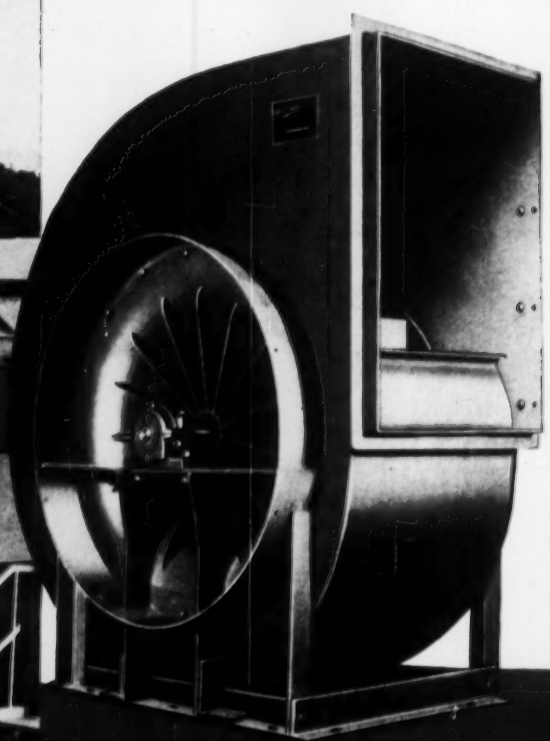
Not because of first cost, certainly. We build into "Buffalo" Type BL Limit-Load® Ventilating Fans the characteristics we know they must have to give the best possible service. This refusal to short-cut quality has occasionally cost us some business, but has made "Buffalo" *the* choice for reliability and performance on the job.

Thus, engineers and contractors appreciate the "Q" Factor* built into these fans. They know the smoothly curved inlet collar with "Buffalo" inlet guide vanes reduces entry turbulence and simplifies the duct connection. They know how smoothly and efficiently the backward-curve-blade wheel and properly proportioned housing handle air. They know that performance is stable from free delivery to shutoff. In short, they know they've done the best by the customer in specifying "Buffalo". Bulletin F-101 gives all details — write for your copy and see why "Buffalo" is in so many of the country's finest and largest installations.









"Buffalo" Type BL Limit-Load® Ventilating Fan. Capacities to 500,000 cfm.

*The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.

BUFFALO FORGE COMPANY

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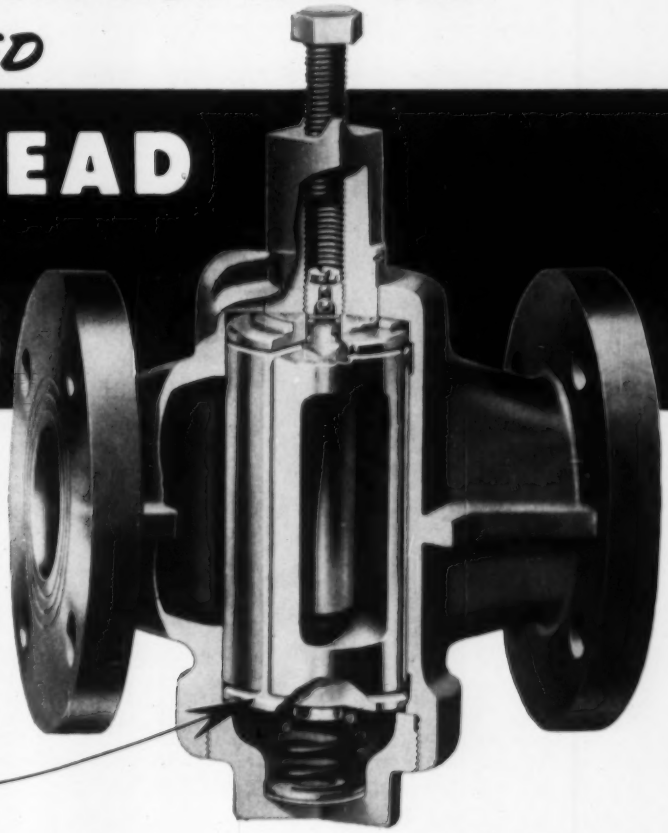
No. 5* of 12 REASONS WHY
YOU SHOULD BUY AND USE
LOW-PRICED

HOMESTEAD
Lubricated
PLUG VALVES



*SELF-FREEING PLUG PREVENTS STICKING

Homestead's exclusive completely controlled lubricant system positively prevents sticking by its instant, piston-like movement of the plug downward at the start of each lubrication. Spring and line pressure return it to stem-sealed position.

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1. Extra long valve life assured by very close tolerance between sealing surfaces.
2. Straight line fluid flow—streamlined ports—minimum resistance to flow—minimum pressure drop.
3. Triple head seal—two lubricant rings and reinforced Teflon stem seal prevent leakage.
4. Easy turning—plug floated on Teflon washer and reinforced Teflon ring.
5. Self-freeing plug prevents sticking.
6. Full-threaded screw prevents dirt being forced into lubricant system.
7. Quarter-turn fully opens or closes.
8. Reinforced Teflon stem seal—no cold flow—continuous, positive seal.
9. Seating surfaces protected in both open and closed positions.
10. High pressure lubricant system provides full lubricant seal around ports.
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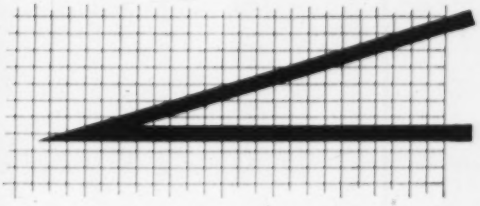
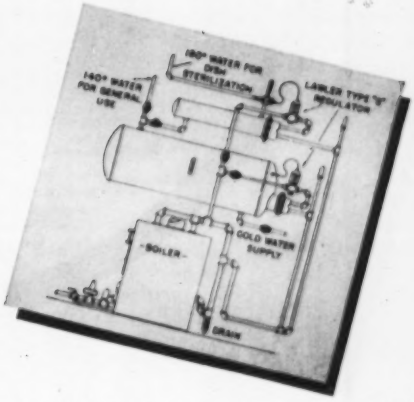
LAWLER TYPE "S" TEMPERATURE REGULATOR

DIRECT ACTING — Accurately controls all steam heating equipment. Protects against over heating . . . a rise in temperature above setting closes valve.

REVERSE ACTING — For cooling systems and recirculating lines. Rising temperature opens valve . . . drop in temperature causes valve to close.

THREE WAY — Mixes hot and cold liquids . . . delivers them at a constant pre-determined temperature.





ONE DEGREE OFF — up or down, and the Lawler Type "S" Temperature Regulator is in action . . . correcting to and maintaining the desired temperature.

Hydraulically formed bellows are non-ferrous, give "hair-line" control with instant response. Highly polished stainless steel valve stem provides friction-free operation for real rugged performance . . . longer lasting durability.

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THE Lawler Line of Thermostatic Control Valves

Steam Temperature Regulators
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DESIGNERS AND PRODUCERS OF THERMOSTATICALLY OPERATED VALVES SINCE 1895

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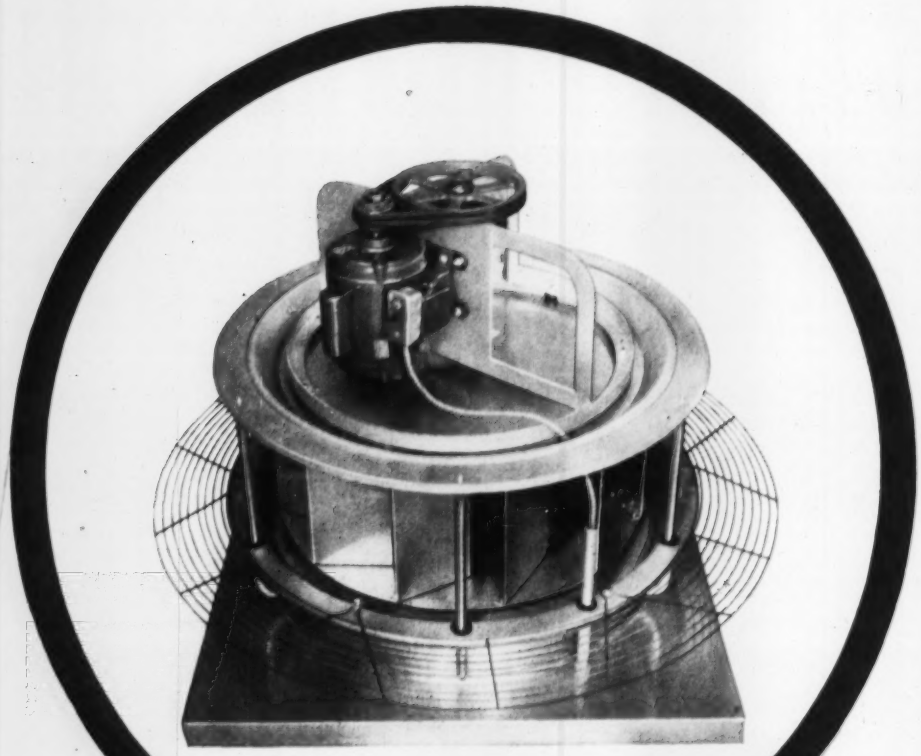

Jenn-Air Belt Drive Roof Exhauster with cover removed. Fewer parts and superior engineering assure long life and smooth, quiet operation.

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power roof exhausters complement the roof lines of today's buildings

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Modern factory and commercial buildings are being planned for appearance as well as utility. Jenn-Air's years-ahead design meets both requirements. No longer is it necessary to rely on industrial-type exhausters of out-dated design, to meet the higher capacity requirements. Instead, Jenn-Air's Belt Drive Roof Exhausters combine low contour streamlining with new rugged construction.

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There's a Skidmore Pump designed for each and every heating requirement.

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New, wider range of discharge pressures — from 10 to 40 lbs. Capacities range from 500 to 10,000 sq. ft. E.D.R.

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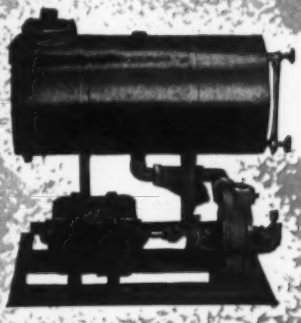
Completely assembled on either steel or cast iron base — capacities, for boilers up to 250 H.P., with discharge pressures to 150 lbs.



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Sturdily constructed for dependable service at small investment — capacities, 1,000 to 65,000 sq. ft. E.D.R., discharge pressures from 10 to 75 lbs.

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Automatically adjusts itself to the varying conditions of the system. Efficiency maintained. Capacities ranging from 5,000 to 100,000 sq. ft. E.D.R.

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new recessed year-round room air conditioners by

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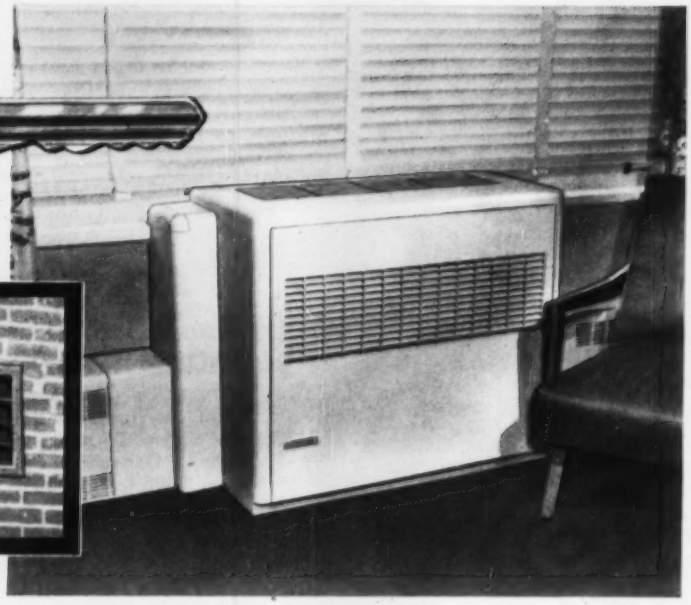

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—Attractive, stainless steel louvre opening fits flush to outside of the building.

New at Chicago's Edgewater Beach . . . and comfort news the country over! This great hotel now adds the guest-pleasing plus of personalized comfort to its world-famous service.

Mueller Climatrol year-round air conditioners replace old-fashioned radiators with tasteful, space-saving beauty — heat with existing steam or hot water . . . cool with their own efficient cycle. Result: a complete, thermostatically-controlled heating and cooling system in each room.

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USES NO WATER. Efficient one-hp refrigeration cycle is air-cooled . . . requires no plumbing or drainage.

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Look to Mueller Climatrol for a complete line of quality heating and cooling equipment for commercial and institutional buildings — fan coils, unit heaters, boilers, heating-cooling combinations and self-contained cooling units. Write for full information.

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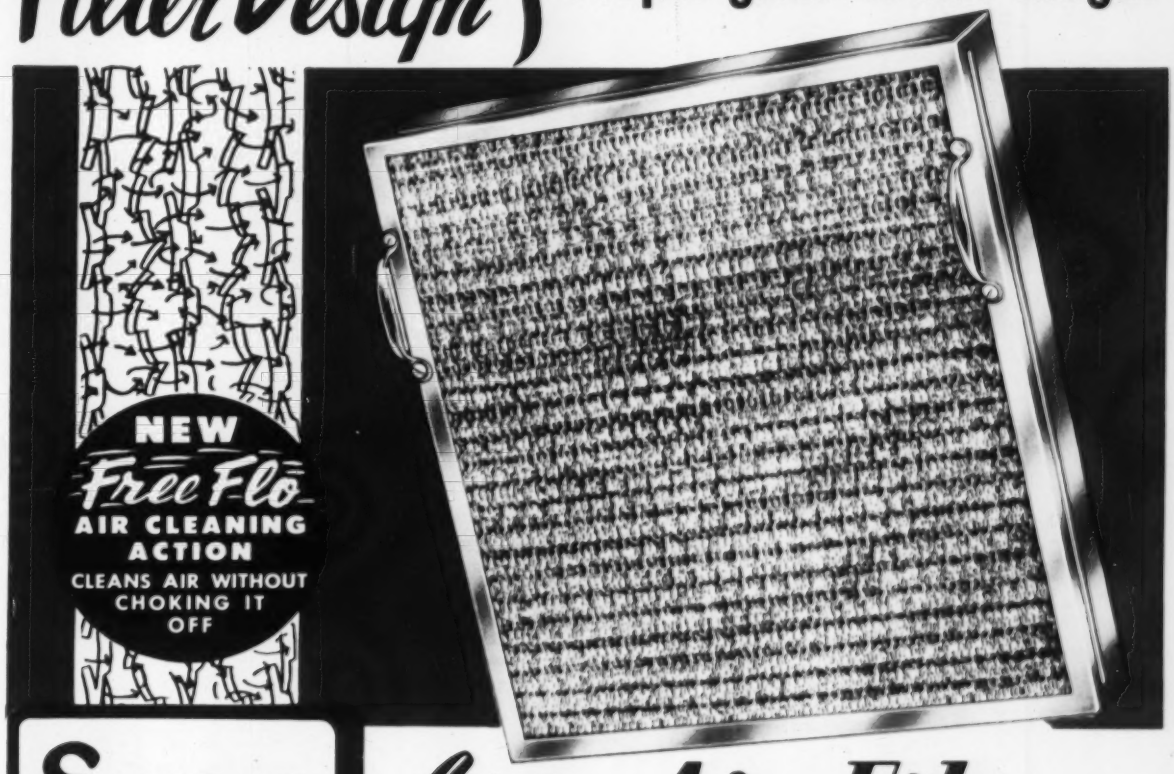
NEW *Filter Design*

29% SLOWER RESISTANCE RISE ...per gram of dirt caught



Evans *Lifelong Air Filters*

Super cleans the air . . . yet maintains FULL FLOW AIR DELIVERY

As filter loads, rate of static pressure rise is low and slow. Low resistance permits faster release of cooled air from cooling coils. Thus blower delivers at peak efficiency all during cooling cycle. No sudden jump . . . no sharp vertical rise in resistance. Air delivery system remains in balance. Resistance rise is slow even from 0.50″ water gauge to 1.00″ or 1.50″ water gauge. High lint (or fibrous material) content in the air does not change this performance.

BIG CAPACITY DESIGN

Enables Evans filter to catch and hold lint without choking off air stream (particularly desirable in super markets, department stores, hospitals, textile plants, and so forth where there is high lint content in the air).

EXTRA HEAVY LIFETIME CONSTRUCTION

All aluminum (heavy gauge). Every part precision made—precision assembled.

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One set of Evans filters last the life of the air handling system. No messy high-tension adhesive oil. Evans fluid has built-in detergent to help clean filters. Hose out with ordinary tap water. Light-weight, extra easy to handle.

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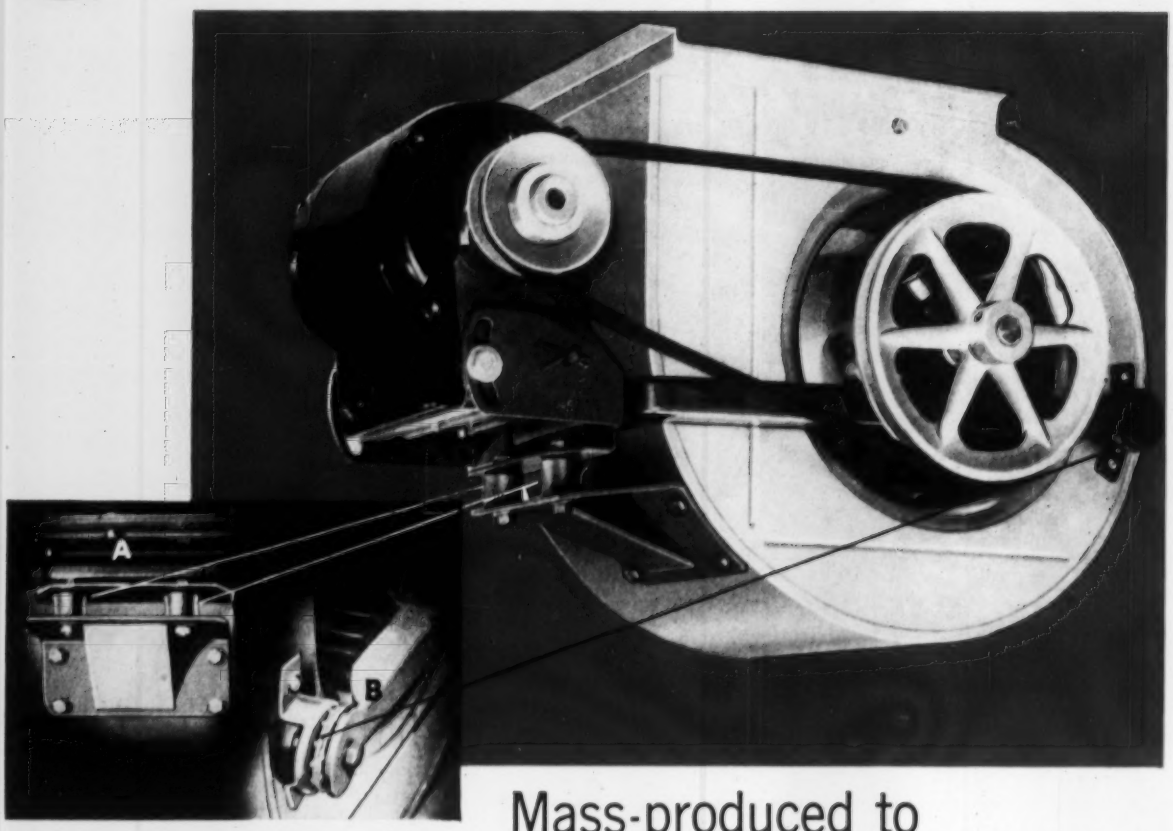
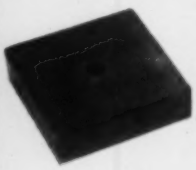
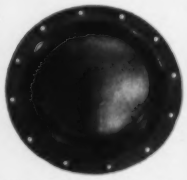


U. S. Molded Shock Mounting for shock absorption when shipping delicate instruments. An electric typewriter manufacturer, for instance, has cut down shipping damage to ½% and cut packaging costs considerably. Improved rubber-to-metal bonding permits their re-use.



U. S. Molded Drop Forge Mounting in service for over 13 years—absorbed *80 million* blows of almost 1600 lbs. force each without wearing out—removed only when steel retaining pins had corroded.

U. S. Molded Diaphragm for controlling liquid flow through motor valves. Offers high burst resistance, retention of molded shape under high pressures, and exact fabric placement.



Mass-produced to exacting specifications

U. S. Rubber Molded Mountings and Connectors help keep blowers operating at "whisper silence".

A well-adjusted system for a forced warm air furnace requires that all vibration and noise be kept to an absolute minimum. In this leading "sulky" type blower, the entire moving parts assembly floats on a cushion of U. S. Molded Rubber Mounts (A) and firm, but movement-free, U. S. Rubber Finger-Flex Connectors (B). In this manner, all mechanical vibrations are isolated—the blower operates in silence.

U. S. Rubber Molded Mountings and Connectors were selected because of their ability to retain "molded in" shape during their entire long life and for the economy they provide.

Yet, this is only one of hundreds of applications wherein U. S. Engineered Rubber Products *do jobs no other material can do.* "U. S." engineers will help you solve any molded rubber problem. Contact us at Rockefeller Center, New York 20, N. Y. In Canada, Dominion Rubber Co., Ltd.

Mechanical Goods Division

United States Rubber

Peerless Development Engineer Richard Thompson (at control board) guides unit through development and George Goldner conducts final inspection.

VERIFIED BLOWER PERFORMANCE

● It just makes good sense to specify Peerless. Every fan or blower leaving our plant is unconditionally guaranteed to meet all established industry test codes (NAFM or PFMA). To an engineer, guaranteed performance means specifying without doubt—to a contractor it means good performance and no callbacks.

OUTSTANDING PERFORMANCE. The outstanding service records of Peerless fans and blowers stem from excellent design and thorough tests in every step of development and manufacture. A minimum of eight, 20-point determinations are made during the development period alone.

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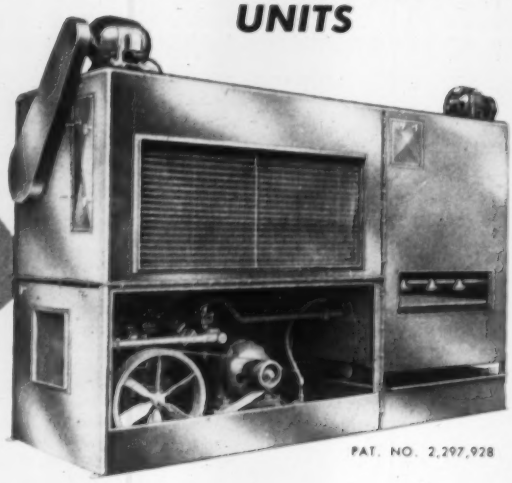
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GOVERNAIR has been building completely packaged air conditioning units longer than any other company in the field. Today, this valuable experience gained, in making hundreds of different types of installation, can benefit you on nearly any type of job you may be planning.

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Added to this is the GOVERNAIR reputation for quality-engineered, longer life products . . . designed to operate at maximum efficiency and economy. *Write for full information.*

ORIGINATORS OF COMPLETELY PACKAGED AIR CONDITIONERS. READY TO OPERATE WITH SIMPLE ELECTRICAL, WATER AND DUCT CONNECTIONS

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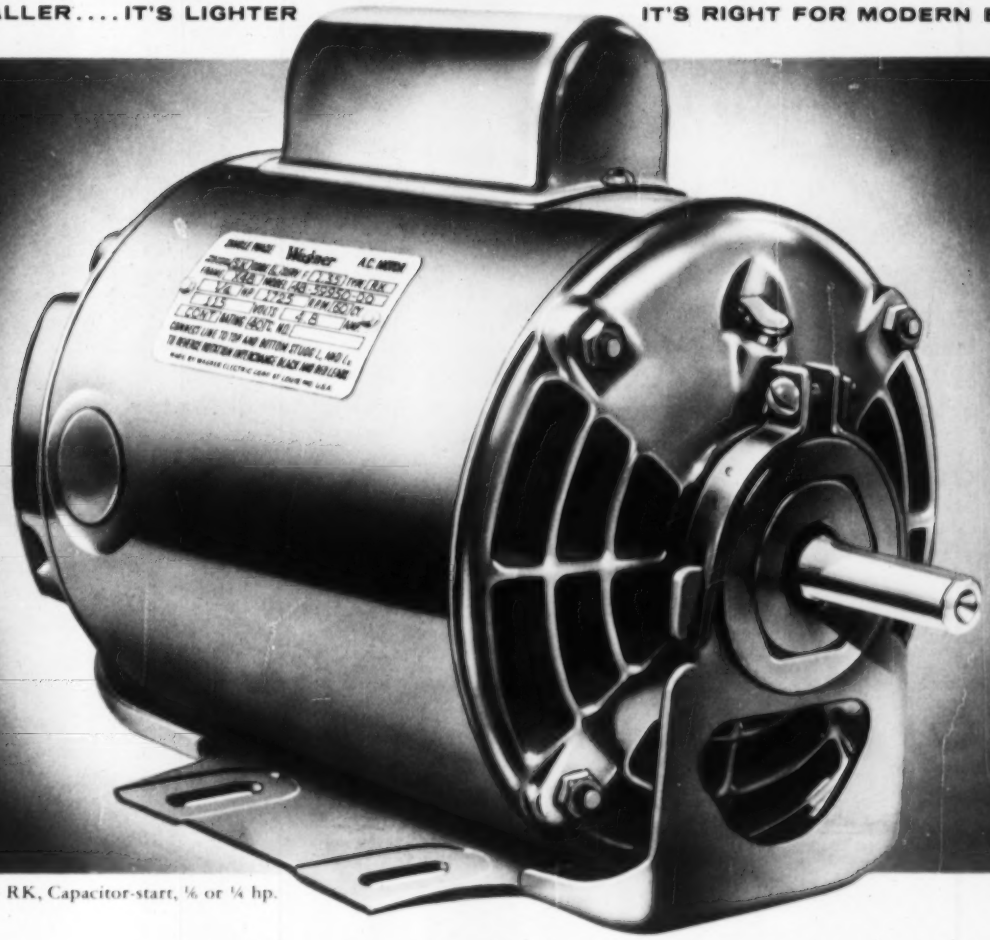
IT'S SMALLER.... IT'S LIGHTER IT'S RIGHT FOR MODERN EQUIPMENT



Type RK, Capacitor-start, ⅙ or ¼ hp.

the WAGNER "48"

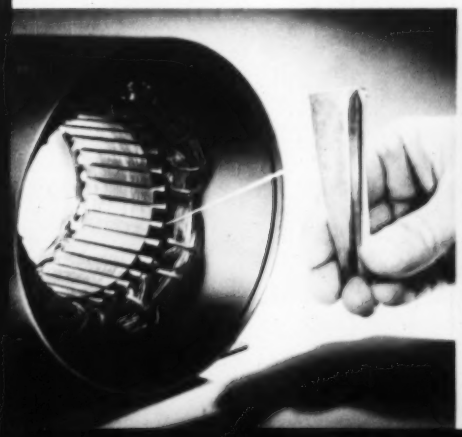
new fractional horsepower motor

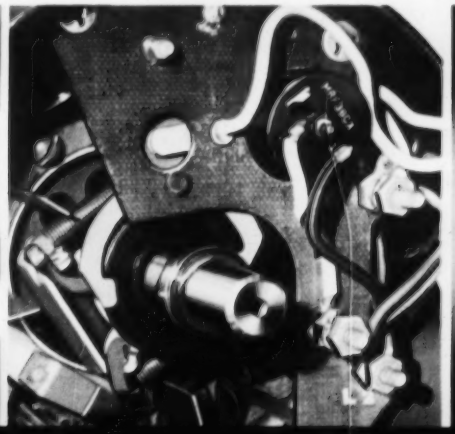
Here's the 48 frame motor you've been looking for! The Wagner "48" comes with either resilient or rigid base ... capacitor-start or split-phase type. You get the standard 48 frame size—with from *three* to *eight* pounds less weight per motor than previous models in the same hp ratings! The Wagner "48" is easier to handle... to stock... to install. Yet it's packed with Wagner quality—a known value for more than 65 years.

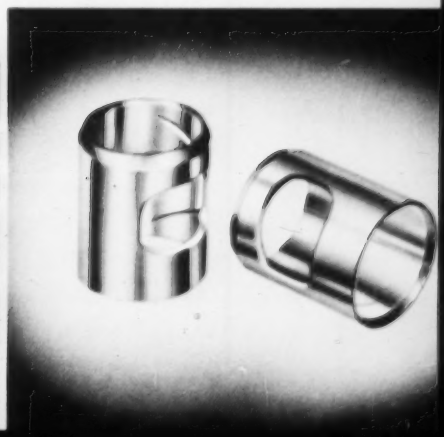
MYLAR*-PAPER LAMINATED SLOT INSULATION combines top moisture resistance with high dielectric strength and thermal stability—gives the Wagner "48" more application versatility, longer life, when unexpected overloads occur. *DuPont trade mark.

QUICK BREAK SWITCH, that disconnects the starting winding and capacitor from the line at a predetermined speed, makes and breaks with minimum arcing—is dependable and trouble-free.

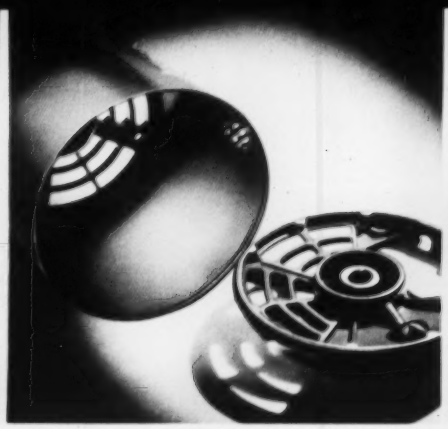
BABBITT LINED BEARINGS give *smooth* performance. They stand heavy pressures with low temperature rise, have superior anti-seizure and non-scoring characteristics, are corrosion-resistant.



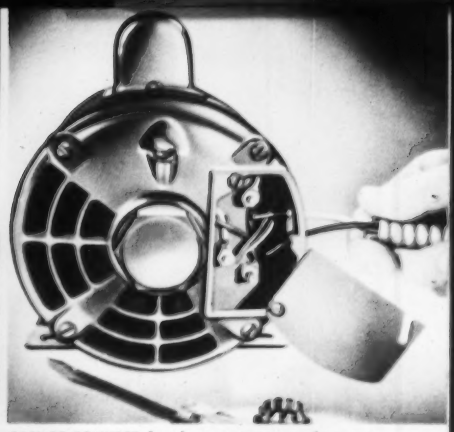




ALL ANGLE OPERATION. You can mount the Wagner "48" at any angle. A new lubrication system assures positive protective lubrication in any position.



LIGHT WEIGHT STEEL FRAME, precision-machined for accurate endplate fit, combined with CAST ALUMINUM ENDPLATES, gives the "48" strength with light weight.



EASY TO CONNECT. Just loosen one screw for access to terminal board. **EASY TO SERVICE** . . . no need to disconnect leads when removing endplates.

solves problems for the design engineer

For design engineers who've been looking for light weight, fractional horsepower motors with less bulk—here's good news!

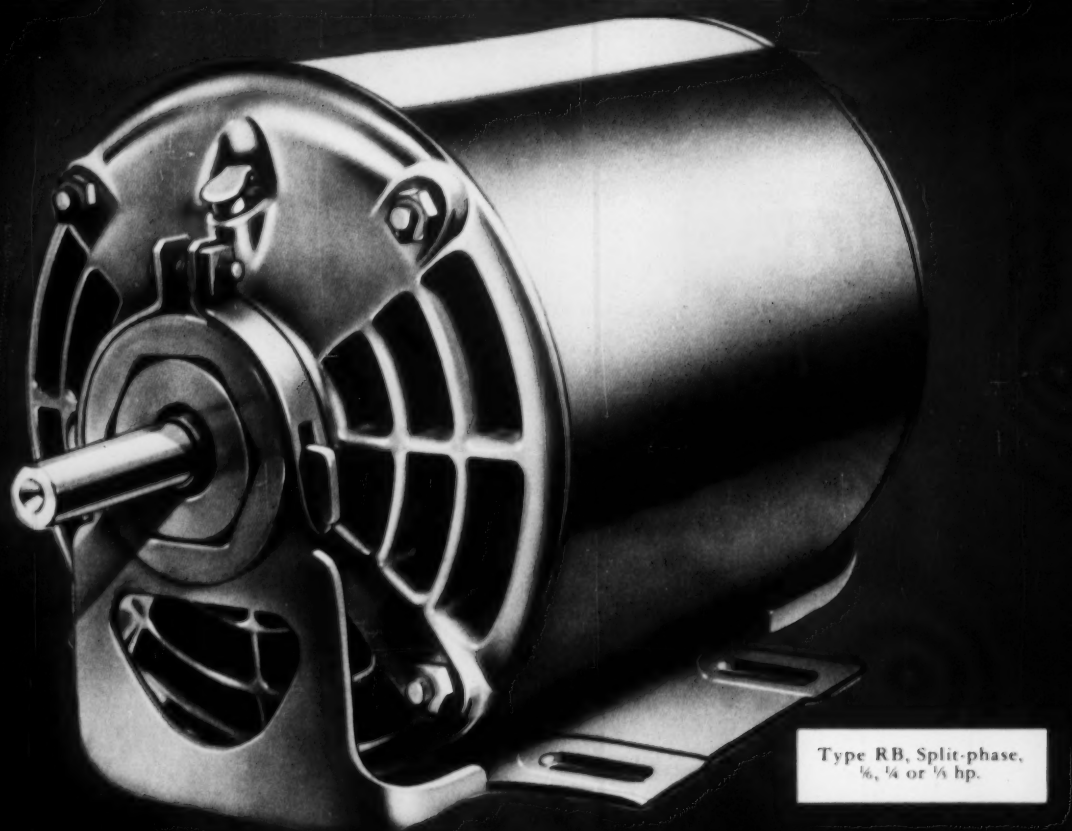
Wagner "48" capacitor-start or split-phase motors are rugged enough to permit direct mounting, are compact enough to fit in tight spots, are exceptionally light in weight, and operate efficiently when mounted at any angle. Both types are available with resilient bases or with rigid bases that are *welded* to the steel motor frames to provide great strength. Through ventilation assures cool running motors that last longer.

If you would like to test the new Wagner "48," one of our field engineers will be glad to furnish a sample motor. Contact the Wagner Branch near you or write us.

WAGNER ELECTRIC CORPORATION . . . 6400 Plymouth Avenue, St. Louis 14, Missouri

M56-16

the WAGNER "48"



Type RB, Split-phase, 1/6, 1/4 or 1/3 hp.

Prepared by the Engineering Department of Tuttle & Bailey, New Britain, Connecticut

Proper Methods of Dampering

It is impractical to design a duct system accurately enough so that no balancing will be required. It is also impractical to design an air distribution outlet that will not require balancing. Therefore in an air distribution system, it is necessary to use dampers to balance shorter lengths of ductwork against the duct having the longest equivalent length of run.

Dampers for Grilles

Figure 1 shows several common types of dampers and the distribution of air over the face of the grille which they provide. Type A is a quadrant-operated blade-type damper. It is apparent that in the partially-closed position the air must pass adjacent to the side-walls of the duct itself, and if there is insufficient length between the damper and the grille, the air does not have an opportunity to re-expand to distribute itself over the entire grille face. Therefore the effective area of the grille is reduced.

Type B, a two-blade opposed-acting damper, confines the air stream to a single jet when the damper is modulated toward the closed position. This produces improper distribution at the grille because the stream has insufficient opportunity to expand. There is also a mistaken conception that when this damper is moved toward the closed position, it will reduce the effective area of the grille in such proportion that the same throw is maintained for a smaller quantity of air. Since the throw varies inversely as the square root of the effective area of the grille, this cannot be true.

Type C is a multi-louvre damper that tends to segregate the air into smaller jets than either Types A or B. The expansion distance on the leaving side of the damper need not be as great as with the other two styles. Therefore the grille more nearly fills with air. In this respect this damper is superior to the previous types. However, the damper has the inherent fault that, as it is adjusted toward the closed position, the angle of air discharge from the grille is affected. On large size dampers it is difficult to lift the entire weight of the blades by means of an operator, and the force exerted by the air stream on the blades is unbalanced.

Perhaps the best type of damper is the opposed-blade damper, Type D. Each blade is center-pivoted. The forces acting on either side of the pivot point are equal and the force necessary to operate the damper from a closed to an opened position is only that required to overcome the friction of the operating mechanism of the device. Each blade moves toward the adjacent blade when closing and creates a series of small jets which join quickly and more nearly fill the grille.

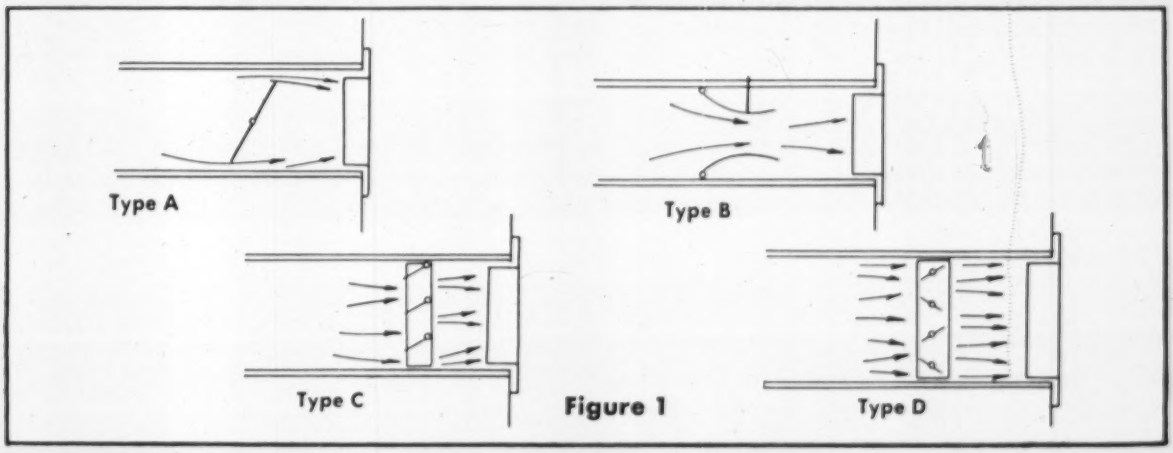


Figure 1

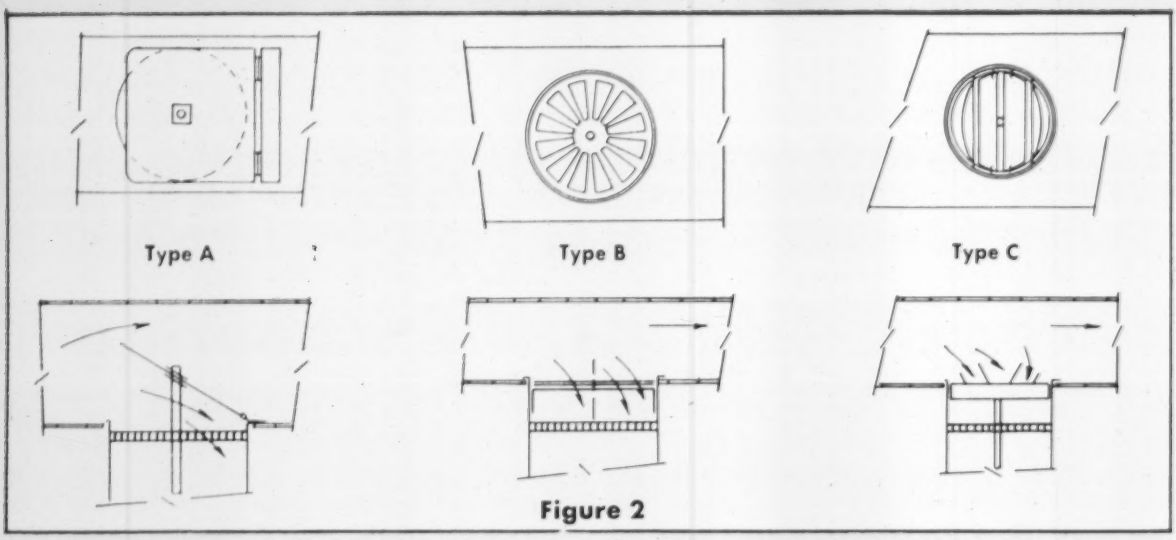


Figure 2

Dampers for Ceiling Diffusers

Figure 2 shows several types of dampers for use with ceiling diffusers. Type A is a so-called "splitter damper." While easy to construct, it causes the air to pile up on one side of the diffuser and prevents equal distribution around the entire 360° periphery. A distribution grid should always be used with such dampers to equalize air flow. When in the open position, the damper narrows the available duct area with which to pass air on to subsequent diffusers.

Type B, a sliding-plate damper is composed of three sections of plates stamped with identical slots. When these slots are aligned, the damper is in its maximum open position, and as the plates are moved toward the closed position, the slots are restricted. This damper causes jets, but the jet areas are small and, therefore, the expansion distance required is much less than in the case of Type A.

Type C is a multi-louvre circular damper contained in a framework which tends to straighten the air on the leaving side of the damper blades. Friction devices prevent the damper blades from changing position, regardless of air pressure. This type of damper acts to equalize the air flow at any damper position.

General Application Data

In an open position, dampers should have an effective area equal to, or greater than, the air distribution devices they serve. If the damper has less effective area in its open position than the air outlet, and is coupled with the outlet, high velocity jets will occur, resulting in an outlet not completely filled with air. Thus, the jet velocity through the diffuser will be dictated by the area of the damper itself. The throw of the air stream will consequently be longer than desired and the total pressure required in the branch duct will be considerably increased.

It is difficult to balance a system with the grilles or diffusers removed. Therefore, any dampering device should be provided with an operative means accessible from the face of the grille or diffuser.

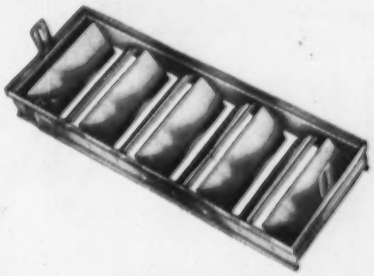
As much distance as possible should be left between any damper and its air outlet to allow full jet expansion to take place, and air straightening devices should be used where insufficient distance is available.

If you have a specific problem involving air distribution, Tuttle & Bailey's Engineering Department will welcome the opportunity to be of help. Address: Engineering Department, Tuttle & Bailey, New Britain, Connecticut.

Tuttle & Bailey Dampering Devices
. . . *make system balancing easier!*

Dampers for use with Grilles:

Vectrol consists of a series of curved blades attached to a frame which pivots on a mounting bracket. The blades operate as a unit and will maintain any desired setting regardless of the system pressure.



VC-7 Opposed Blade Volume Control, furnished as an integral part of T&B registers, is also available as a separate device for installation behind grilles. Opposed blades provide positive setting from fully open to fully closed.

Dampers for use with Ceiling Diffusers:

No. 4 Volume Control Damper provides a convenient and accurate method of regulating the volume of air discharged from T&B diffusers. The damper blades divide the air stream into small segments which minimize turbulence and result in quiet operation.

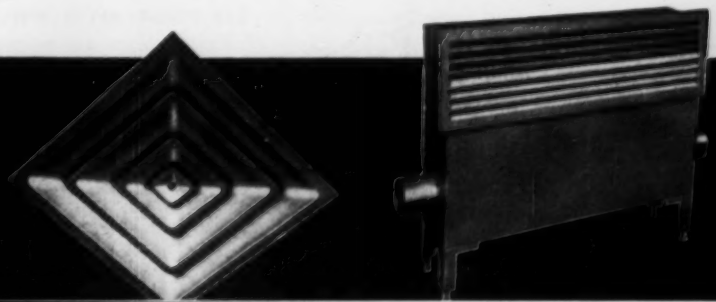
No. 6 TFD Volume Control Damper is a simplified, adjustable damper designed for use where close-coupled connections are required.

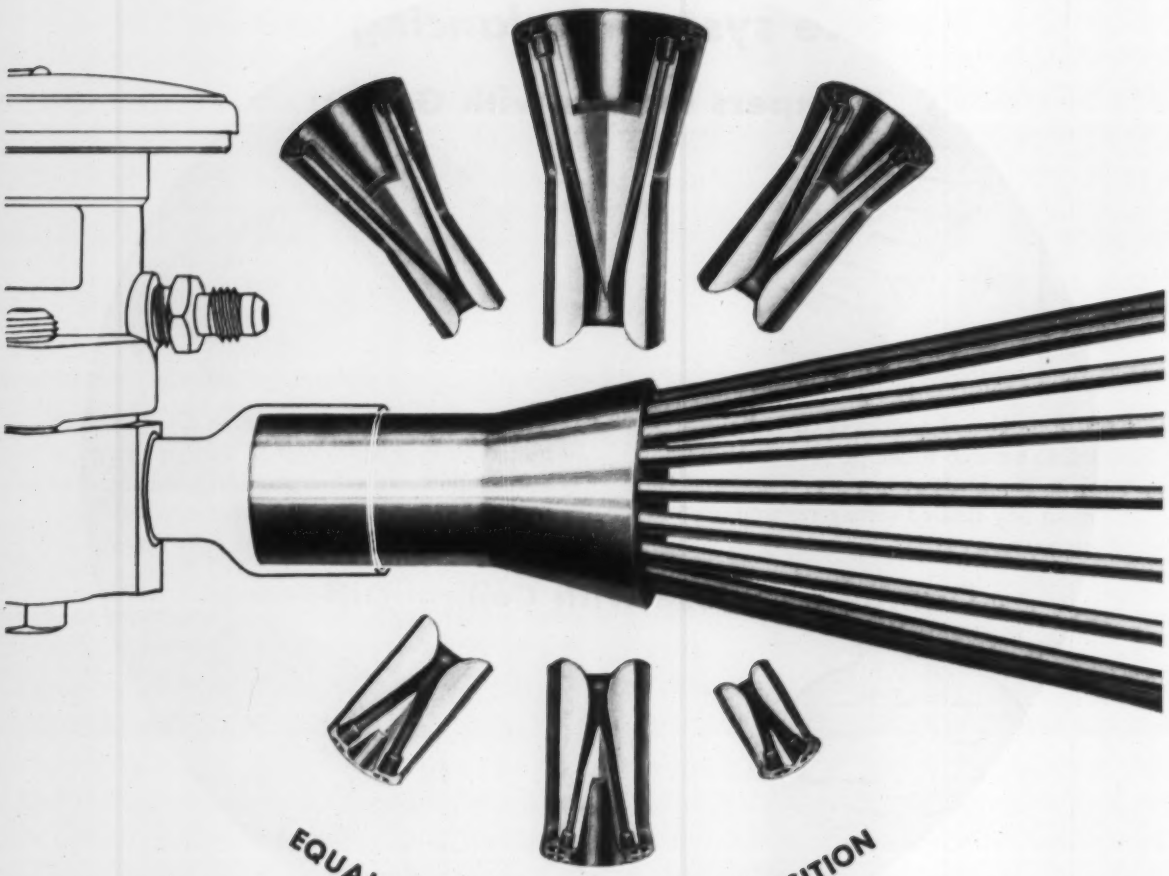
For catalogs on the above T&B Dampers — and the complete line of T&B Air Distribution Devices, write —

TUTTLE & BAILEY

division of Allied Thermal Corp. New Britain, Connecticut

A complete line
of air distribution equipment and accessories
for low and high pressure systems





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Low pressure drop—Permits closer, more economical thermo valve sizing.

Wide application range—from 25% of capacity to 150% of rated capacity.

One-piece—No nozzles or orifice plates to stock and install.

One Venturi-Flo replaces distributors requiring as many as 6 or 7 nozzles!

Easy to select—No nozzles to size.

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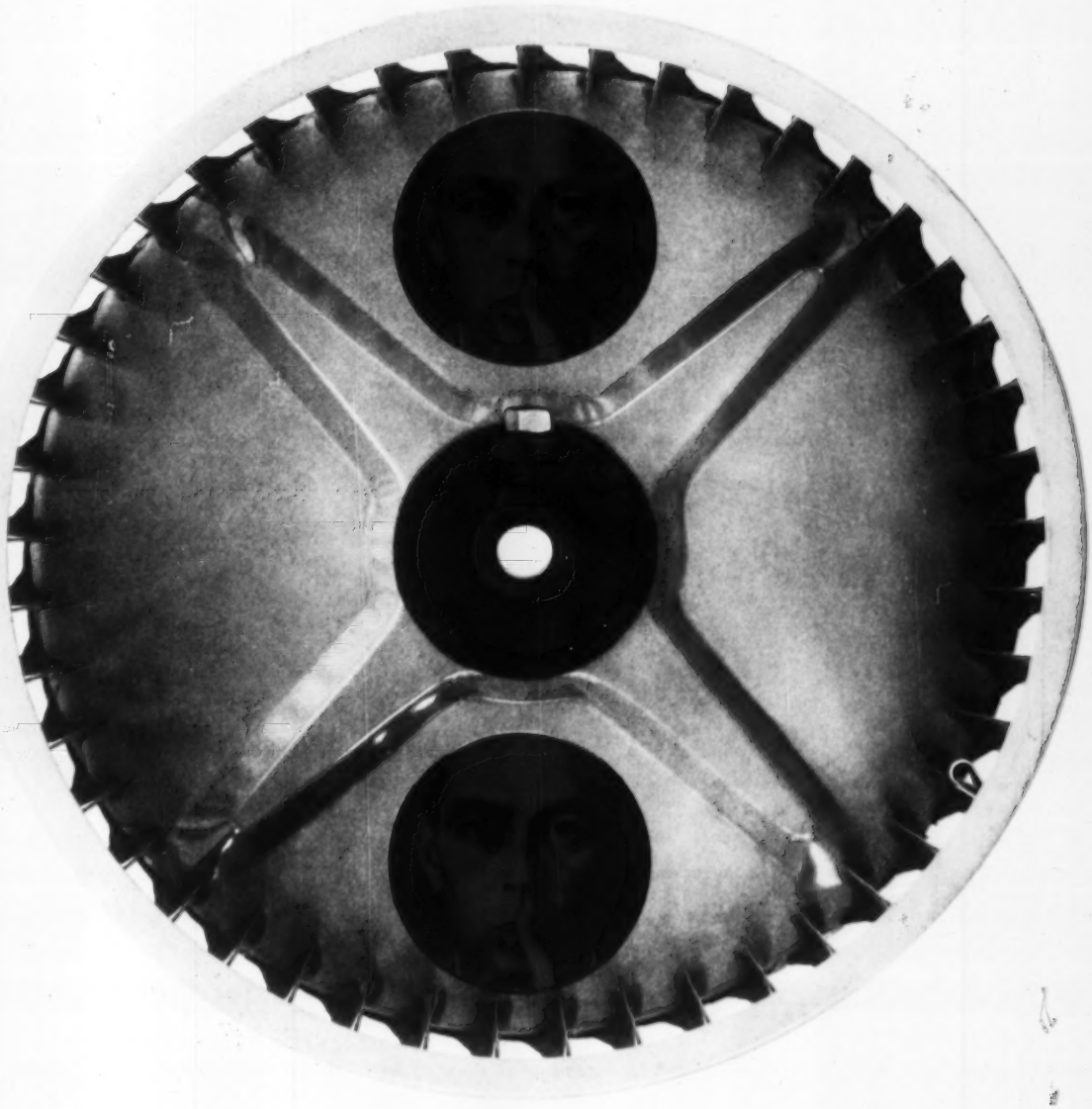
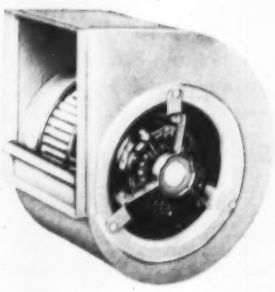


SILENCE IS THE HUB* OF THE MATTER



*NEOPRENE Noisy fans are fine—at ball games. But here at Utility, we frown on noise in any form, particularly where it concerns our Direct Drive Blowers. And we've done something about it in the form of a new type blower hub that provides quiet operation under all conditions. The material we use in this hub is Neoprene. How do we do it? Well, that's the "secret of silence" of all Utility Direct Drive Blowers. It took time. It took effort. But we think you'll agree that the end justified the means. For due to this Neoprene hub and the extra bonus of silence it delivers, extra sales are showing up on the books of manufacturers of heating, cooling, refrigerating and ventilating equipment. Just another example of Utility's no-nonsense approach to engineering problems that makes it the firm to consult when only the best in blowers and blower parts will do in your equipment.

YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE! Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

A Division of Utility Appliance Corp.

UTILITY FAN CORP. 911 East 59th Street, Los Angeles 1, California

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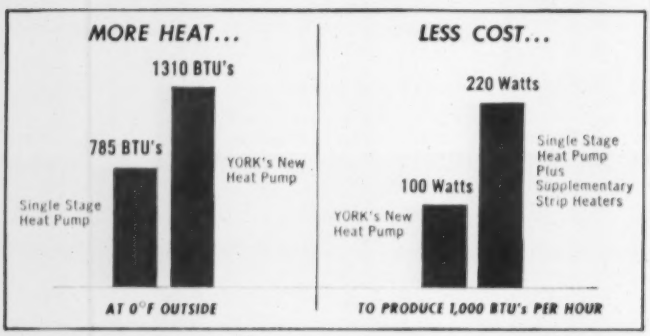
Even when it's zero, there's enough heat in the outside air . . . .

Now! York heat pump takes warmth out of



MORE HEAT AT LESS COST! As shown in the chart at left YORK'S new air-to-air heat pump system* produces 67½% more heat at 0°F outdoor temperature than the former single-stage system of the same mechanical displacement. To supply the same heat output with the single-stage system would require supplementary strip heating and total wattage requirement would be 120% greater per 1000 BTU than YORK'S new compound compression system.

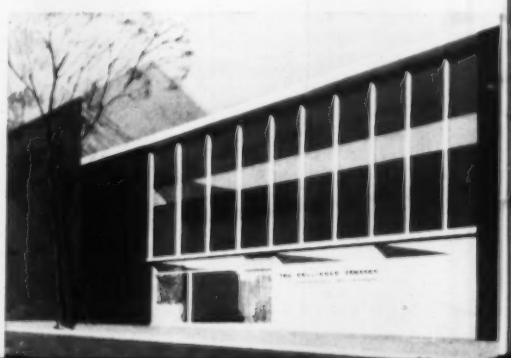
*Patent applied for.

FIRST MAJOR INSTALLATION was at Heironimus department store in Roanoke, Va. served by the Appalachian Power Co. of The American Gas and Electric System.

Hayes, Seay, Mattern and Mattern, Architects and Engineers; B. F. Parrott and Co., Contractor.

NEW BUILDING for Ballinger Co. of Philadelphia features York heat pump, and is served by The Philadelphia Electric Co.

Ballinger, Architects and Engineers; J. S. McQuade, Jr., Contractor.



. . . . to heat every room in your building!

sub-freezing air to heat an entire building

DRAMATIC ADVANCE MAKES HEAT PUMP PRACTICAL—WITHOUT SUPPLEMENTAL HEATING

The development by York engineers of the first practical heat pump to use below-freezing outside air promises convenient, more economical year-round air conditioning with a single system. No longer will supplementary strip heating equipment be needed in areas where winter temperatures drop below freezing.

The big difference in the York heat pump is that it takes advantage of a long-utilized refrigeration technique, compound compression. The system is operated by thermostatically controlled valves. These valves guide hot or cold water in and out of the system while compressors automatically move from single-stage compression into compound compression when the temperature drops below a certain point. Now that the high-operating-cost problem of auxiliary strip heating, needed where temperatures drop much below 32° F., has been eliminated, builders and owners can offer customers year-round air comfort at lower annual cost.

Electric Utilities faced with uneconomical air conditioning load factors will now be able to profitably promote the heat pump above the Mason-Dixon line. Until now the high operating cost of the air-source heat pump has limited application in Northern areas. But elimination of heat pump capacity deficiencies at low temperatures and removal of the very low load factors of strip heaters makes the new system attractive to both user and utility. For full details on the York heat pump write: York Corporation, subsidiary of Borg-Warner Corporation, York, Pennsylvania.

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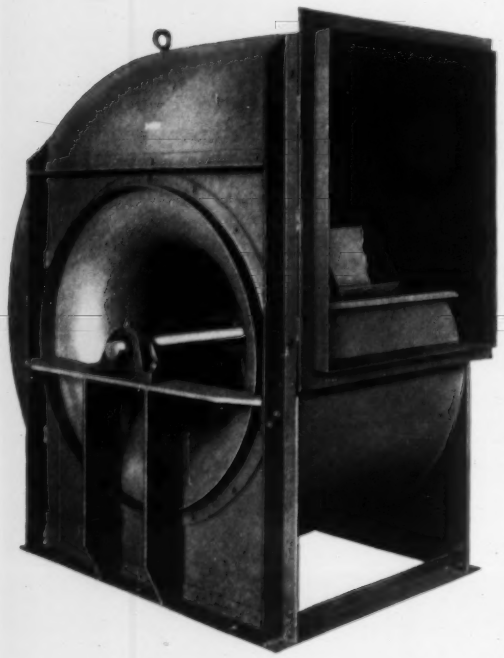

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Two types of fan wheels. Housing dimensions remain the same but performance characteristics differ.

Forward Curve wheels offered from 7½ to 73 inch. Capacities up to 70,000 cfm.

Quiet operating, medium speed (IPL) wheels with non-overloading horsepower characteristics for heating, ventilating and air conditioning or industrial applications. Wheel diameters from 15 inch to 73 inch, with any speed or discharge required. Capacities up to 123,000 cfm. Class I, II, or III construction.

All-welded housing featured as standard construction for simplicity, extra strength and rigidity—dust tight and leak proof. Bolted (knock-down) type available in Class I and Class II. Split housing can be furnished as extra if required.

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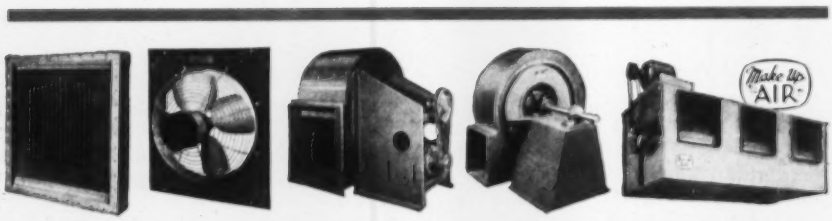

When working on your air handling problems, consult the *nyb* representative nearest you in our nationwide service or write for bulletins.

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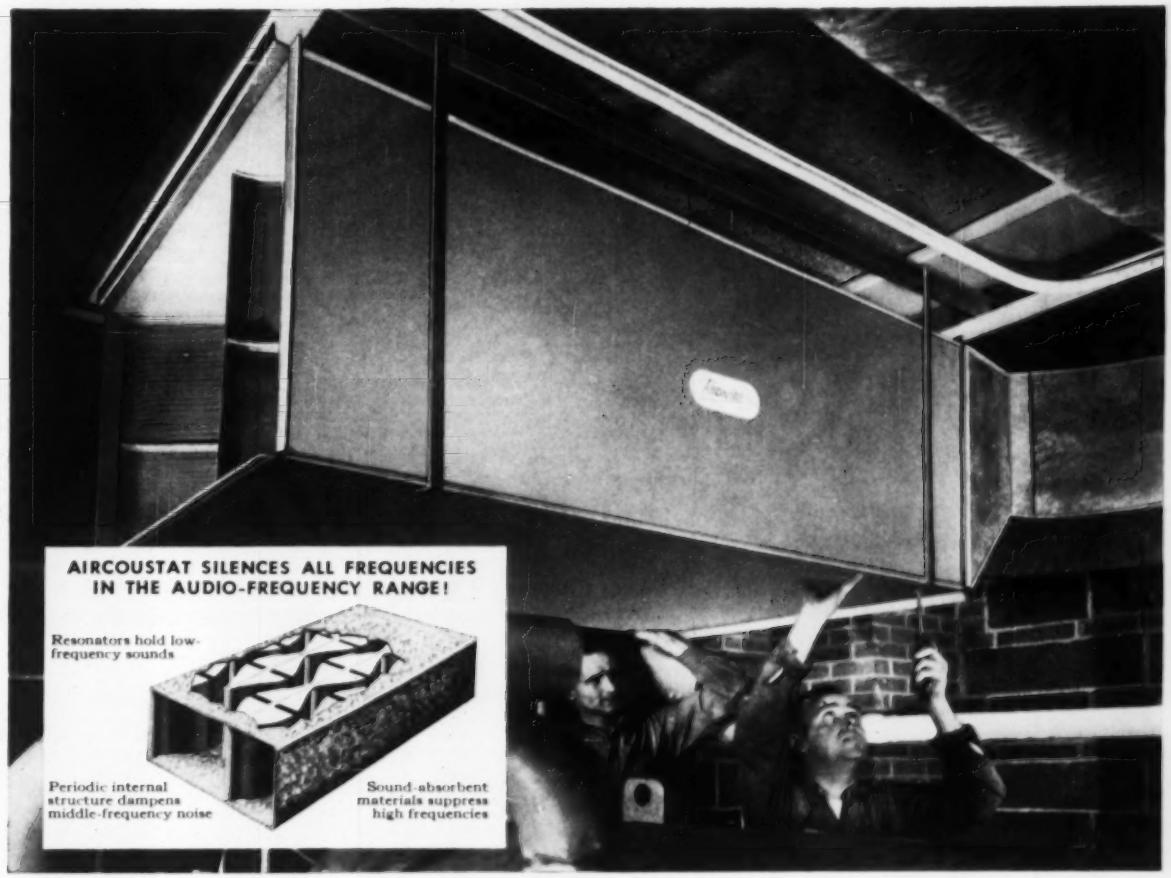
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Beth-Co-Weld Pipe in air-conditioning systems of these Miami Beach hotels

Three sumptuous ocean-front hotels at Miami Beach have one point in common: Hundreds of feet of Beth-Co-Weld steel pipe in the air-conditioning systems. The pipe for each installation was furnished by A & B Pipe & Supply Company and installed by Hill-York Sales Corporation, both of Miami.

Beth-Co-Weld is ideal pipe for air-conditioning systems, and for heating and plumbing work, and sprinkler installations, because it is so easy to cut and thread. It's sound pipe, with a tight weld, because it is made from good steel by the continuous-weld process.

While the demand for steel pipe is heavy, jobbers are making every effort to carry stocks of Beth-Co-Weld in these sizes:

DIAMETER	WEIGHT	LENGTHS
½ to 4 in.	Standard	21 ft, plus or minus 1 in.;
½ to 3 in.	Extra Strong	also random lengths

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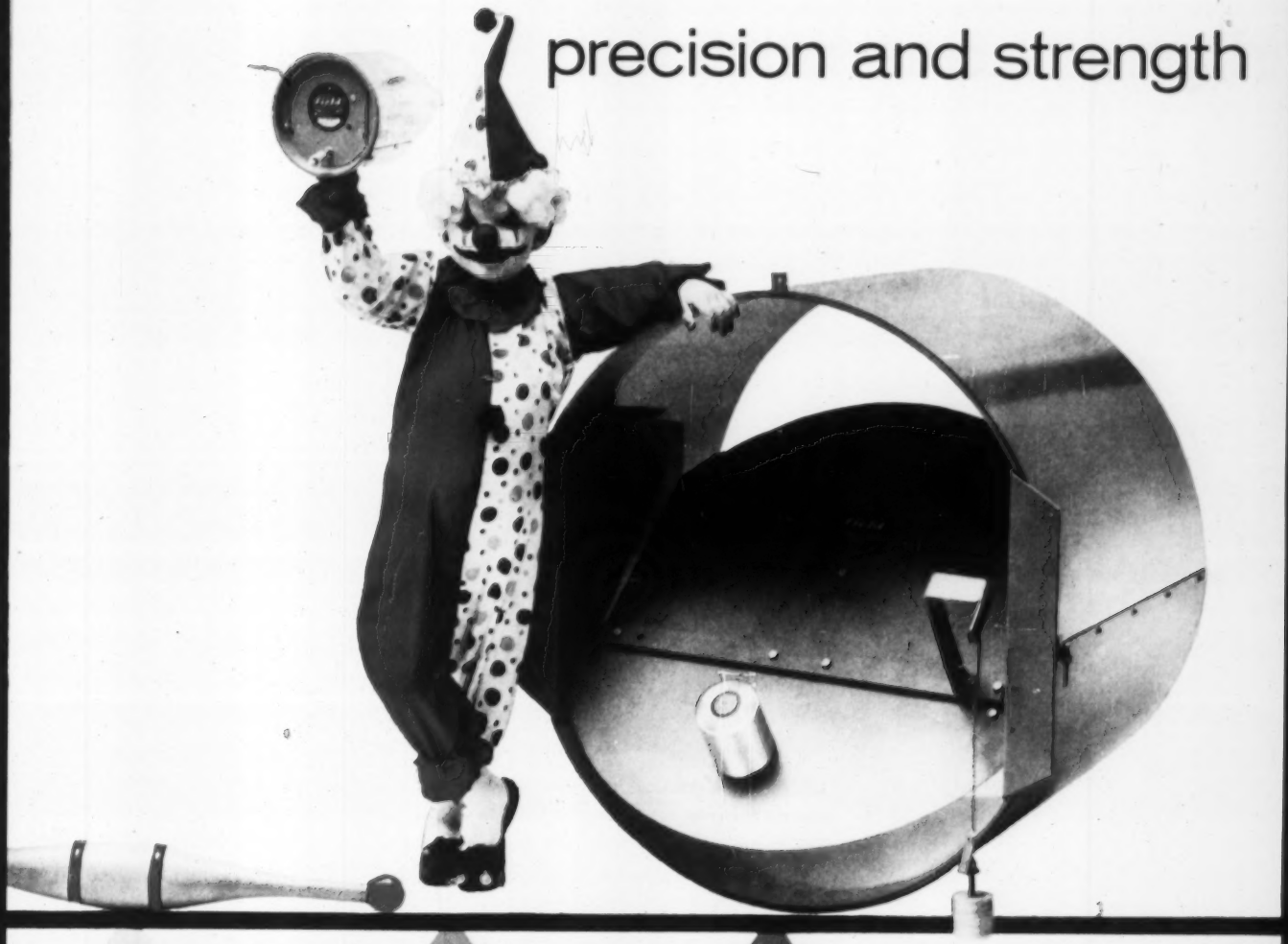
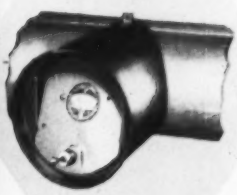
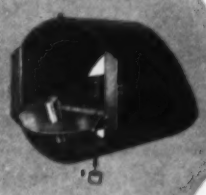




SIZES
6" THRU 32"
Field "M" Controls for oil and coal fired domestic, commercial and industrial heating plants



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8" THRU 32"
Field "MG" Double-Acting Controls for gas fired commercial and industrial heating plants

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Field "RC" Controls for domestic oil and coal fired heating plants, for flue sizes 5" through 10"

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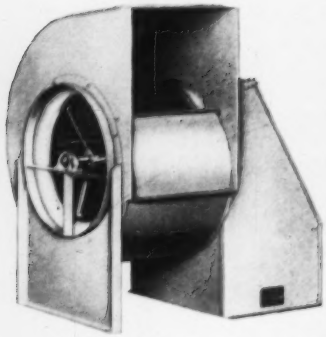
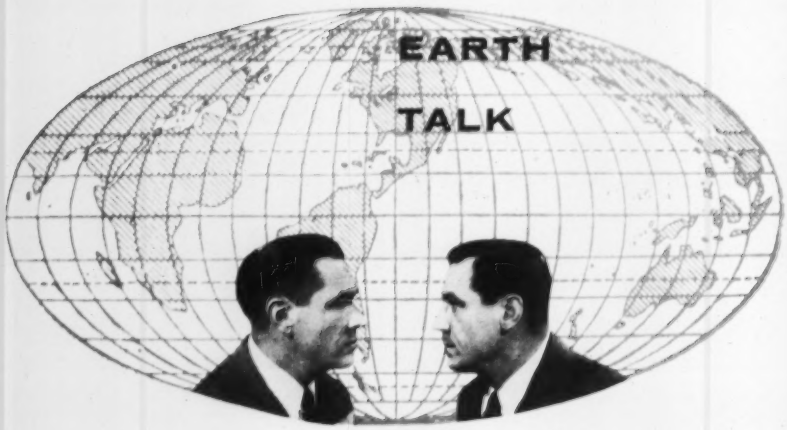


DOWN TO EARTH TALK



ON A BUY IN THE SKY

Let's face it: isn't it time something was done about "the forgotten fan?" Tucked away on the roof — but **not** out of harm's way — it takes a grueling beating from wind and the weather. If maintenance isn't up to snuff, it frequently breaks down from exposure and lubrication neglect.

Utility has the practical, down to earth solution: a complete series of Enclosed Drive Blowers designed for outdoor service, all with completely enclosed motors and drive to protect them against dirt, moisture and drastic temperature changes. Lubricated for life with permanently sealed, pre-greased ball bearings, they'll never break down from lack of proper maintenance.

This achievement in creative engineering is one more excellent reason to recommend Utility Enclosed Drive Blowers to meet every specification, be in line on every bid. Next job, plan with Utility to keep costs down while delivering the absolute maximum of outdoor service!

UTILITY FAN CORP. *911 East 59th Street, Los Angeles 1, California*

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

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ANEMOSTAT *Announces . . . .*

ALL-AIR

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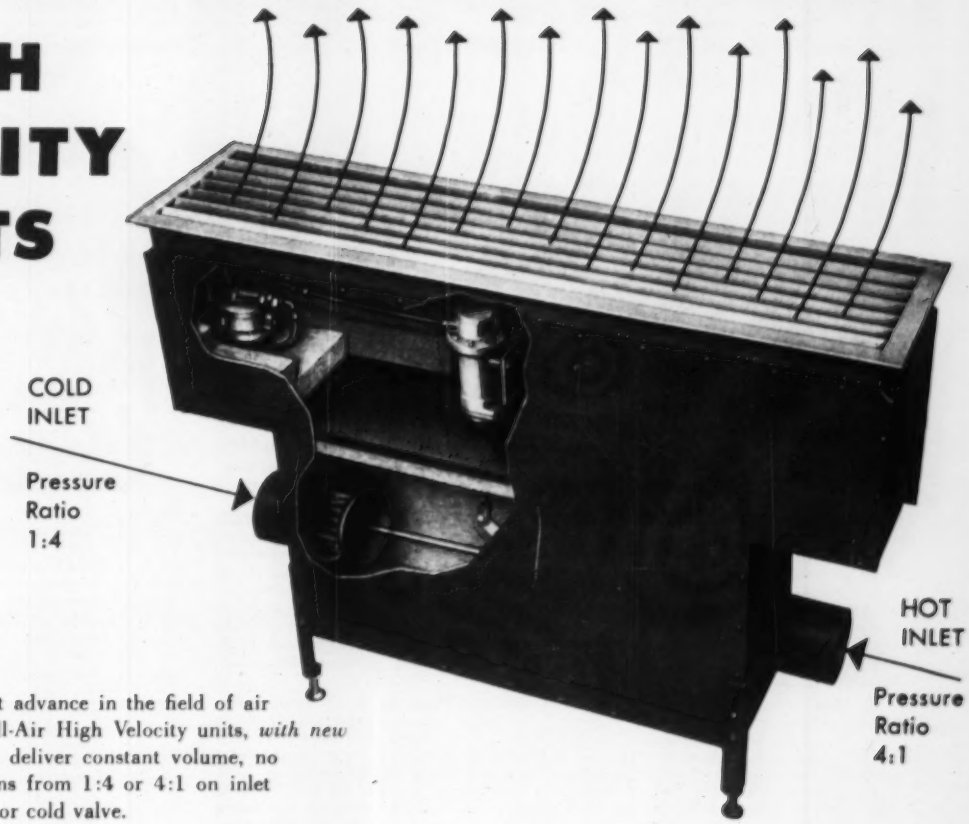

Here is a vitally important advance in the field of air distribution. Anemostat All-Air High Velocity units, *with new simple automatic controls*, deliver constant volume, no matter what the fluctuations from 1:4 or 4:1 on inlet pressures of either the hot or cold valve.

Each unit is a single package including the controls and integral thermostats if required. There is complete accessibility of all controls through removable diffusers. No access panels are required. Capacities of CONSTANT VOLUME units can be pre-set at the factory.

These Anemostat CONSTANT VOLUME units

- Assure scientific draft-free distribution of air.
- Are available in 100% induction units.
- Include Anemostat die-cast metal rocket-socket valves. More than 50,000 of these valves are in service, and not a single one has needed maintenance.
- Operate on standard 15 lb positive acting compressed air systems.

See your nearby Anemostat representative for complete details on these revolutionary Anemostat All-Air CONSTANT VOLUME High Velocity units.

Anemostat: The Pioneer of All-Air High Velocity Systems

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Cyclotherm Series
Hot Water Boilers range
in output from 670,000
Btu to 6,700,000 Btu and from 4,467
to 44,667 sq. ft. of EDR.

Now you can get the economy and efficiency of a packaged boiler in modern hot water heating. The new Cyclotherm Hot Water Line has been designed expressly to meet the demands of complex, forced circulation heating systems. Now your heating plant can have the economy of operation, maintenance and installation . . . the versatility and space saving of a *Cyclotherm*. Here is one package boiler engineered specifically to service multiple hot water lines of varying requirements, and equipped to handle, at maximum efficiency, return lines with large temperature differentials. And Cyclotherm guarantees 80% fuel efficiency, operating at either peak demand or partial loads—with modulation controls available on most models.

By now, almost everyone knows about patented Cyclotherm Cyclonic Combustion. Injected at a tangent, high velocity air forms a swirling tube which hugs the inside wall of the combustion chamber. The fuel is introduced into the entering air, where it is slowly, but completely consumed as it moves in a cyclonic motion through the combustion chamber. This highly luminous, slow burning flame transfers, by radiation and convection, between 65 and 70% of the heat value of the fuel. At the same time, a layer of air separates the flame from the firetube to prevent hot spots and flame impingement. At the end of the firetube, the hot residual gases are deflected through the return tubes to deliver an additional 15 to 20% fuel efficiency.

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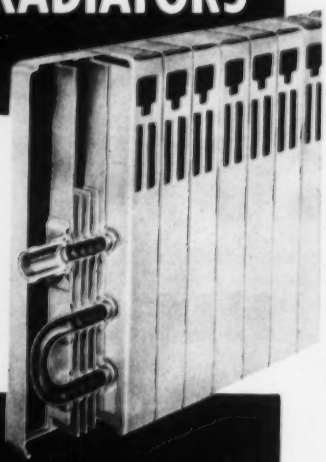

. . . designed for *PROPER* distribution of 2 kinds of heat

"Heat conditioning" a room requires 2 kinds of heat: *radiant* heat to warm solid objects, and *convected* heat, to warm the atmosphere.

Shaw Radiators deliver these two kinds of heat in unvarying, health-guarding proportions that only Nature, at her best, can duplicate. Shaw's exclusive AIR-e-ATED Radiant Heat is an engineered combination of radiant and convected heat that creates and maintains *natural* comfort in room areas.

AIR-e-ATED Radiant Heat is made possible by Shaw's completely self-contained design, which features full length steel heating fins and exterior radiant panels permanently bonded to the hot water or steam heating coils. Shaw-distributed heat is the standard by which we judge our individual comfort.

Write today for full information. And ask for your free copy of "Solving Modern Room Heat Distribution Problems".

SP-12

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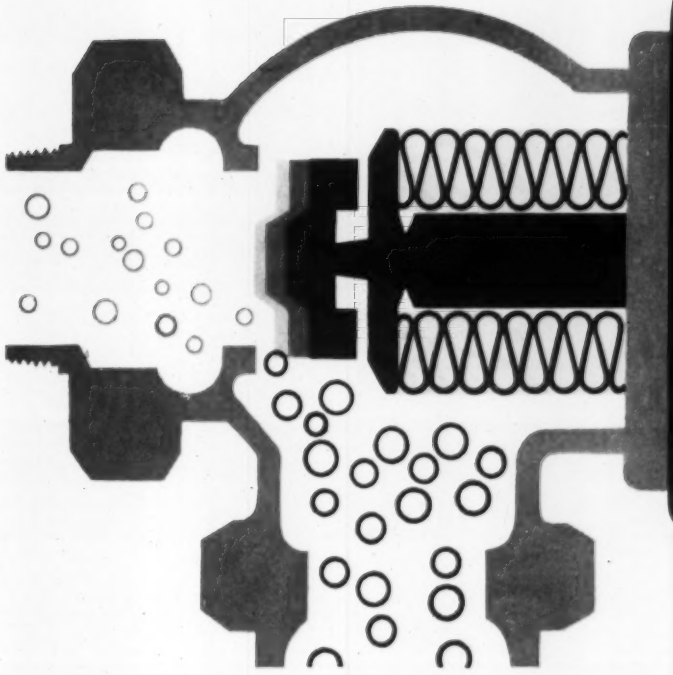
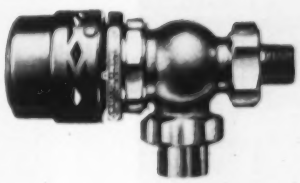


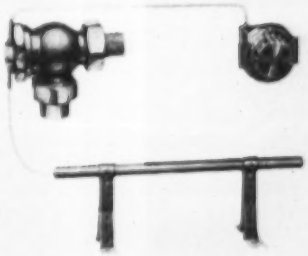
Anyone can afford room temperature control the Fulton Sylphon way

With Fulton Sylphon Automatic Radiator Valves, individual room temperature control is practical and economical for any building heated by steam or hot water radiation systems. First off, this type of control costs less than most. Your installation costs are lower because there is no electrical wiring, piping, or accessory equipment. Owner operating costs are lower because these self-operated valves require no outside source of power. And unlike "on-off" controls, they *throttle* heat input *continuously*. This action not only conserves the heat supply medium, but also keeps rooms from alternating between "boiling hot" and "stone cold."



FOR EXPOSED RADIATORS

No. 885 Automatic Radiator Valve is not only self-powered, but also self-contained so that it simply installs in place of the hand valve. For either steam or hot water systems. A turn of the valve head sets it to maintain any temperature between 60° and 75° F. Packless valve eliminates maintenance problems. ½", ¾" and 1" valves. No. 885 Valve can also be used with convectors and finned pipe.



CONVECTORS · CONCEALED RADIATORS

The No. 895 Automatic Radiator Valve is designed especially for the regulating and installation requirements of enclosed steam, vapor or vacuum units. Only the control knob shows. Adjusts instantly for any temperature from 40° to 90° F. Valve is packless . . . no packing replacement problems. Valve sizes ½", ¾" and 1". Fulton Sylphon offers Model No. 522-A for hot water installations.

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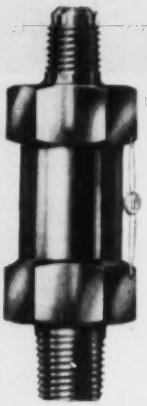
FULTON SYLPHON DIVISION · Knoxville 1, Tennessee

HENRY ASME relief valves

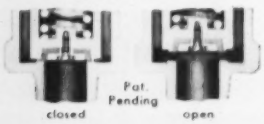
for Extra Capacity Extra Safety



Type 523 Straight-Through Relief Valves

FOR FREON AND SIMILAR REFRIGERANTS

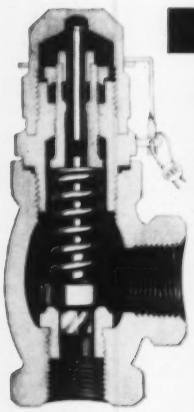
This relief valve has the Henry "Controlled Cushion" cup seat disc construction which prevents deformation of sealing ring and assures consistent operation. This design provides positive relief at predetermined set pressures. Brass construction. Sizes (inlet x outlet) ½" M.P.T. x ⅜" Flare; ½" F.P.T. x ½" F.P.T.; ¼" F.P.T. x ¼" F.P.T.; and 1" F.P.T. x 1" F.P.T.



"Controlled cushion" cup seat disc construction

ASME
NB National Board Certified

All Henry Relief Valves in the sizes and types listed below are constructed in accordance with the standards of the ASME. In addition these valves are stamped NB to indicate National Board Certification as to capacities.



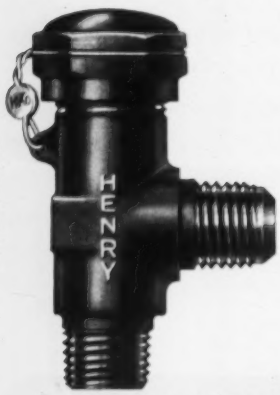
FOR AMMONIA

Angle Relief Valve

Has soft metal alloy seat and push rod for emergency reseating. Stainless steel trim. Sizes (inlet x outlet) ½" F.P.T. x ¼" F.P.T.; ¼" F.P.T. x 1" F.P.T.; and 1" F.P.T. x 1¼" F.P.T.

Type 52 Angle Relief Valve

This forged brass valve is available in sizes (inlet x outlet) ½" M.P.T. x ⅜" Flare and ⅜" O.D.S. x ⅜" O.D.S.



All the above valves can be furnished at any desired pressure setting in the range of 50-350 P.S.I.

Write us for data sheet #AE-1303 showing new increased capacity ratings of these Henry relief valves.

See your Henry wholesaler for these certified relief valves.

HENRY VALVE CO.

Melrose Park, Ill. (Chicago Suburb)

Cable: HEVALCO, MELROSE PARK, ILLINOIS

Specialized Manufacturers of the Complete Line of Relief Valves for Refrigeration and Air Conditioning

HENRY VALVE CO. CONTROLLING FLOW SINCE 1914

Typical plant ceiling showing foil-faced Pittsburgh Fiber Glass insulation in position.

"Pittsburgh Superfine is easiest to apply... most efficient insulation for steel buildings"

SAYS MR. CHARLES W. JACKSON, *President of Quonco, Inc., fabricated steel building sales and erection firm of Indianapolis, Ind.*

Experience has taught Quonco, Inc., that it takes more than conventional material to properly insulate a fabricated steel building. First of all, the material must be self-supporting and preferably blanket-type. It must be lightweight and very easy to handle. Further, it must be extremely efficient in insulating against heat loss and absorbing noise.

Quonco found all of these insulation advantages in one product—Pittsburgh Superfine Fiber Glass. Mr. Jackson, President of the Indianapolis firm, sums up the advantages this way: "Since Pittsburgh Superfine in our buildings reduces heat loss to only ¼ that of conventional masonry buildings, our customers can plan for a lower initial investment in heating equipment and cut their estimated fuel costs considerably." As an example, Mr. Jackson cites the case of the world's largest fabricated steel building—7½ acres—in which 300,000 sq. ft. of Pittsburgh Superfine was used. Only one of the plant's three boilers, and 7 of the plant's 12 air supply units is needed to maintain a comfortable 75° for over 4000 employees. Even during hot summer months, temperatures are 10° to 15° cooler inside without air conditioning.

If plant and office modernization or construction is part of your current plans, be sure to know about the unusual features and savings that Pittsburgh Superfine insulation can provide you. For your copy of Bulletins F-100 and F-140, write Fiber Glass Division, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pa. For immediate service on your specific problem, you can call the nearest Fiber Glass Division sales office listed below.

PITTSBURGH SUPERFINE FIBER GLASS IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, and St. Louis

FIBER GLASS

PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

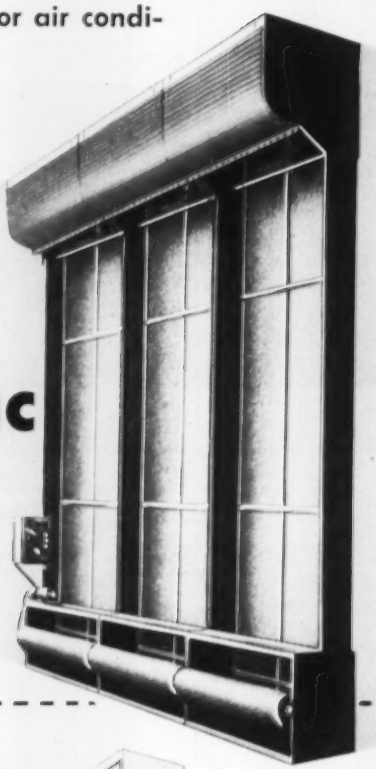
PITTSBURGH PLATE GLASS COMPANY

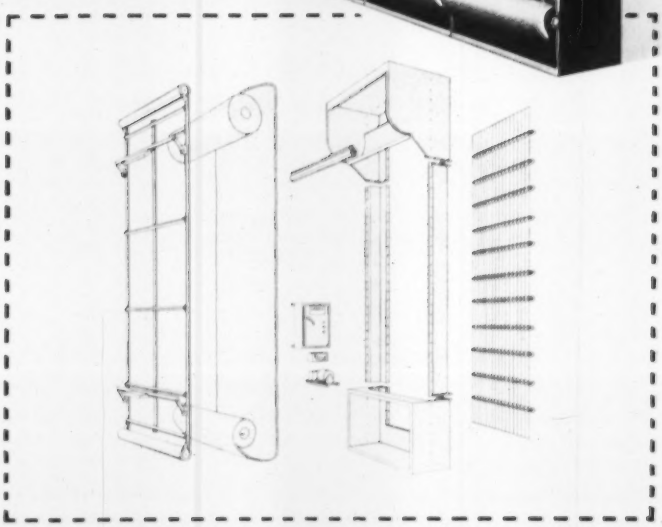
Announcing . . .

This latest addition to the Green Line of Equipment features simplicity of design with an absolute minimum of operating costs, maintenance and service. It is generally used for the filtration of air for air conditioning, ventilation, heating, paint spray booths, etc.

Sure Seal

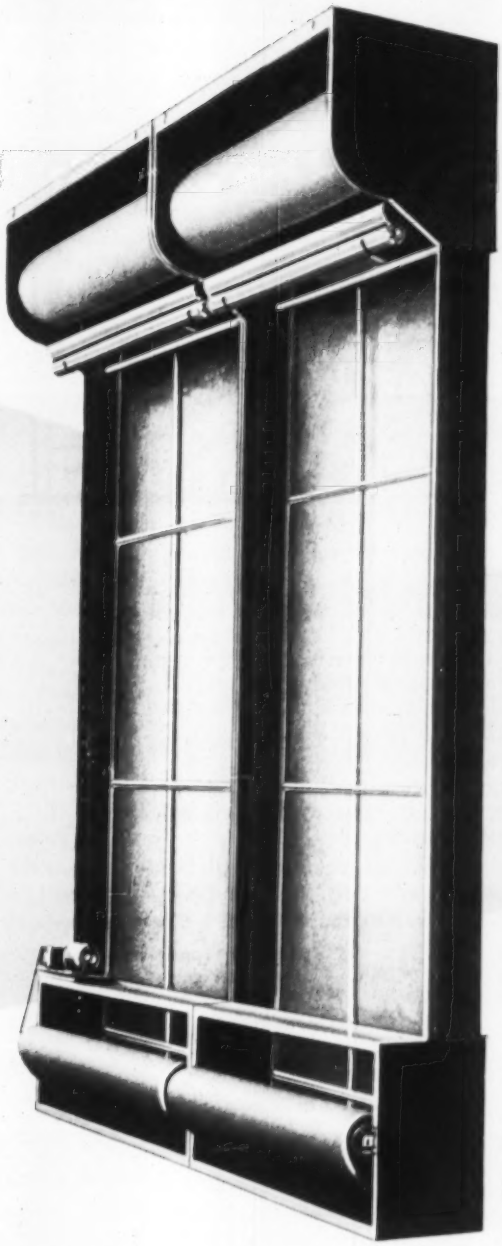
AUTOMATIC AIR FILTER





Showing elements that go into the Green SURE SEAL Automatic Air Filter, (left to right), floating tubular seal; roll of clean filter media (top), continuous filtering surface and take-up roll (bottom), frame to hold top and bottom rolls; control and driving mechanisms; media retaining grill.

ANOTHER PRODUCT BY *GREEN*



The SURE SEAL Automatic Air Filter unit gives these outstanding advantages:

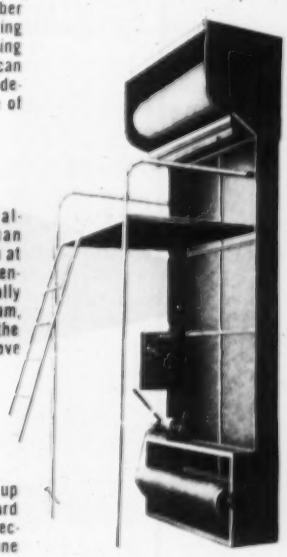
Maximum Filtration...
by locating both media supply and take-up spools away from filter face area.

Positive Sealing...
the unique design of the counter-weighted, self-adjusting tubular steel frame maintains a constant seal in normal operation and—what is most important—while indexing.

Filter Media...
is a special non-inflammable glass fiber impregnated with a viscous oil coating with high dust holding and removing properties. One roll of filter media can last from six months to one year, depending upon the amount and nature of air contaminant.

Controls...
are either "Timer-Actuated", to allow a pre-selected amount of clean media to be drawn into the air stream at regular intervals or "Pressure Differential Actuated", which will automatically move clean media into the air stream, whenever the pressure drop across the media due to dust loading rises above a certain point.

Designed to fit many needs...
These units are furnished in sections up to fifteen feet high — and in standard widths of three, four and five feet. Sections can be installed adjacent to one another to make up any width.



When writing for further information, why not tell us your needs? We shall be glad to have the opportunity to serve you. You can have confidence in the Green Line, which for many years has included, Mechanical Draft Fans, Economizers and Dust Control Equipment.

U.S. PATENTS PENDING

Send for Bulletin #175 describing fully the Green SURE SEAL Automatic Air Filter

THE GREEN FUEL ECONOMIZER CO., INC.
POWER AND PROCESS PLANT EQUIPMENT
BEACON 3, NEW YORK
Tel. Beacon 316

How to Reduce CONDENSATION!

Prevent Damage to Wood, Plaster, Paint, etc.

As air becomes colder, it can hold less vapor in suspension. The degree of saturation increases until a dew-point is reached and condensation occurs.

Heat flows from warm to cold by conduction. A material in contact with air colder than itself on one side, warmer than itself on the other side, will *continuously* extract heat from the warmer air by conduction and lose it to the colder air. As the contacting warmer air becomes cooler, the amount of vapor it can hold in suspension without condensing becomes smaller.

The denser and bulkier the material, the more heat it can extract before attaining room temperature, if it *ever* does. The scientific construction of multiple layers of aluminum and air spaces minimizes condensation formation on or within this type of insulation.

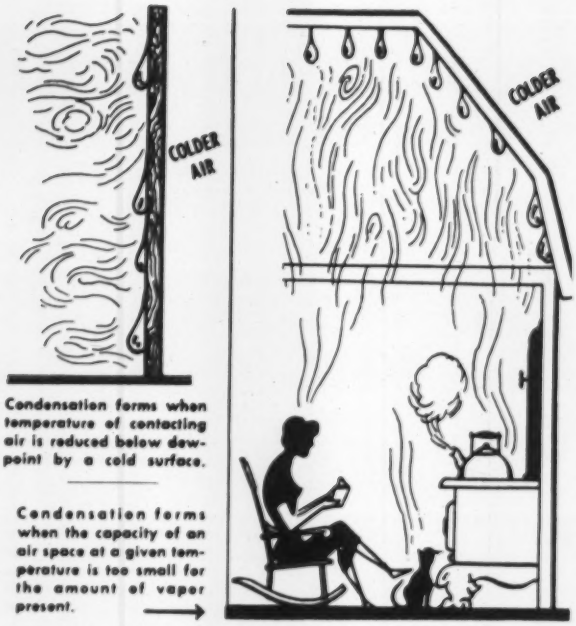
THE REASON CONDENSATION IS MINIMIZED

Since the first layer of aluminum adjacent to the warm, inner air of a building weighs only about ¼ oz. per sq. ft., it does not need to extract much heat from that air to attain and remain at room temperature. The emissivity of the aluminum surface is only 3%, so little heat is lost by radiation. This helps the aluminum to remain at about room temperature and not extract much heat from that warmer air.

The other sheets of aluminum and fiber retard heat flow by inner as well as outer convection, and conduction is slight through the preponderant low density air spaces. So the aluminum's other surface faces a space colder than the aluminum itself. Because warmth flows to cold in conduction, the aluminum will *give off a slight* amount of *heat* to the colder space, slightly *increasing* the vapor retaining capacity of that space. The successive reflective spaces and layers of aluminum behave similarly. Since each aluminum surface is slightly warmer than the air it faces on its cold side, no heat is extracted from the colder air; *the reverse is true.*

CONTINUOUS VAPOR BARRIER

When *scientific*, joist-to-joist multiple aluminum is used, fortuitous vapor and water (like rain) which intrude into exterior building spaces will, as vapor pressure develops therein, gradually flow out as vapor, through exterior walls and roofs because vapor flows from areas of greater to less density. The vapor, unable to back up through the long, *continuous, almost impervious* aluminum, will flow out, because exterior walls and roofs have substantial permeability in comparison with aluminum, far greater than the required 5 to 1 ratio. Infiltration under its flat stapled flanges is slight.



Condensation forms when temperature of contacting air is reduced below dew-point by a cold surface.

Condensation forms when the capacity of an air space at a given temperature is too small for the amount of vapor present.

The U. S. Bureau of Standards has prepared a helpful and informative booklet, "Moisture Condensation in Building Walls," which deserves your attention. Use the coupon to get a free copy from us.

THERMAL VALUES, INFRA TYPE 4S

Up-Heat	C .105 = 3⅛" non-metallic insulation*
Wall-Heat	C .068 = 4¾" non-metallic insulation*
Down-Heat	C .042 = 7⅞" non-metallic insulation*

*Based on limiting values of Fed. Spec. HH-I-521c

Cost installed between wood joists, material and labor, about 8¢ sq. ft.

Type 6 also available

Can be purchased everywhere through your preferred local dealer.

Infra Insulation Inc., 525 Broadway, N.Y.C. Dept. H-12
Please send National Bureau of Standards Booklet BMS63.

NAME

FIRM

ADDRESS

Predict 1957 Best Business Year Yet

. . . economists see inflation accounting for much of rise

NEXT YEAR will be the best business year in history, although inflation will account for much of the rise in dollar indicators of business activity.

That is the collective opinion of 221 of the U. S.'s leading economists polled by the F. W. Dodge Corp. in its annual survey of opinions on the economic outlook.

The economists are "unusually unanimous" in their belief that 1957 business will be excellent and that no downturn is in sight, even though most of them do not expect sharp increases in the major economic indicators, said Dr. George Cline Smith, vice president of the Dodge Corp.

The average forecast of the economists, Dr. Smith said, indicated that the gross national product would reach an annual rate of $420 billion by the end of next year. The economists expected personal incomes, prices, and wage rates to rise moderately next year, with industrial production, business investment, and construction activity remaining at about this year's levels.

New plant and equipment expenditures in 1955 totalled about $29 billion, and the Dept. of Commerce estimates that business in 1956 will invest a record breaking total of about $35 billion. The economists in the survey are almost unanimous in expecting that 1957 will be another extremely high year for plant and equipment expenditures. Only five economists expect the 1957 figure to be as low even as last year's $29 billion, while 149 economists expect that the 1957 total will be higher than this year's $35 billion. The average forecast is for plant and equipment expenditures of $37 billion next year, with about three-quarters of the economists setting the figure in the range from $35 to $40 billion, inclusive.

Opinion among the economists is less unanimous on the construction outlook than it is on the other major indicators. The average forecast indicates a very slight rise in the value of construction put in place. During the first half of 1956 the annual rate was a little under $44 billion. The economists on the average expect it to go to $44 billion in the second half of this year, to $44.5 billion in the first half of 1957, and to $45 billion in the second half of 1957. The forecasts for the second half of 1957 tend to scatter widely, with substantial numbers at every level from $40 billion through $48 billion.

It should be kept in mind that this is the forecast of the economists polled by F. W. Dodge Corp., and it is not to be confused with the construction forecast made by the Dodge organization itself. ∓

Navy to List Qualified Pipe Insulation

. . . for purchase specifications

A QUALIFIED PRODUCTS LIST for thermal insulation pipe covering is being established by the Navy's Bureau of Ships, the bureau reports.

Copies of the specification may be obtained from the Commanding Officer, Naval Supply Depot, Scotia 2, N. Y. ∓

HPAC Directory Section Coming in January

. . . thoroughly revised

THE JANUARY HPAC will contain the 23rd annual Directory Section of Heating, Piping, and Air Conditioning Equipment for Industrial, Commercial, Institutional, and Public Buildings.

Thoroughly revised and up to date, the 1957 Directory contains complete product classifications, trade names, manufacturers' addresses, and an additional product classification of all equipment on which information is given in the advertising pages of the same issue. ∓

Rex E. Hieronymous Gets Unusual Tribute

. . . sees own life dramatized

REX E. HIERONYMUS, partner in the Chicago management firm of Aldis and Co. and a member of HPAC's board of consulting and contributing editors, received a unique tribute recently upon his election to honorary membership in the Chicago Building Superintendents' Association.

The presentation was highlighted by a complete dramatization of the life of Mr. Hieronymus patterned after the TV program "This Is Your Life." His family and many of his friends and associates contributed ideas and appeared in person to recreate the most important events in his life. The unusual program was conceived and directed by James R.

Continued on page 64

Announcing a giant stride in air conditioning...

The New Honeywell

A new principle of control that virtually eliminates high velocity air distribution problems

HONEYWELL'S High Velocity Air Blender offers engineers the answer to today's major problems with high velocity air distribution systems.

Now each room served by the system can be individually controlled by its own thermostat, providing a constant comfort level—never too hot, never too cold, never drafty, regardless of the demands put on the system by other occupants or outside weather.

The key to this efficient performance is Honeywell's calibrated dial air balancing system that regulates the total CFM flow of air leaving the blender.

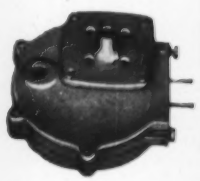
With this system, even though the hot and cold valves are not linked mechanically, they work in unison delivering the exact total flow (CFM) needed to heat or cool a room. There's no excess drain on the system to supply one room that frequently upsets the system flow and temperature in other rooms. And with dial air balancing the system is in balance as soon as it's installed.

Self-powered, the Honeywell Air Blender uses the air pressure of the high velocity air it is controlling to actuate its diaphragm—its *only* moving part.

Cold Valve—(containing the diaphragm—the only moving part), controls the total air flow from the unit.

Hot Valve—like the cold valve, but with a scale on the variable orifice as part of *dial balancing* system.

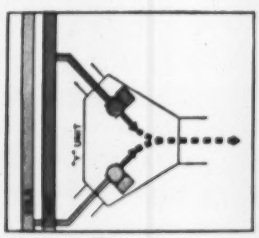
Flow Regulator—with calibrated dial (CFM or inches of water) to pre-set the total flow of the unit.



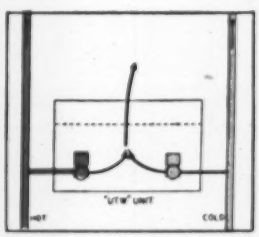
Submaster Regulator—similar to the Flow Regulator but field adjustments aren't needed on this device.

Basic components of the Honeywell high velocity air blender system with typical installations

Honeywell Round Type Thermostat—connects by tube to the Submaster Regulator, providing direct control over *flow*, rather than usual valve position.

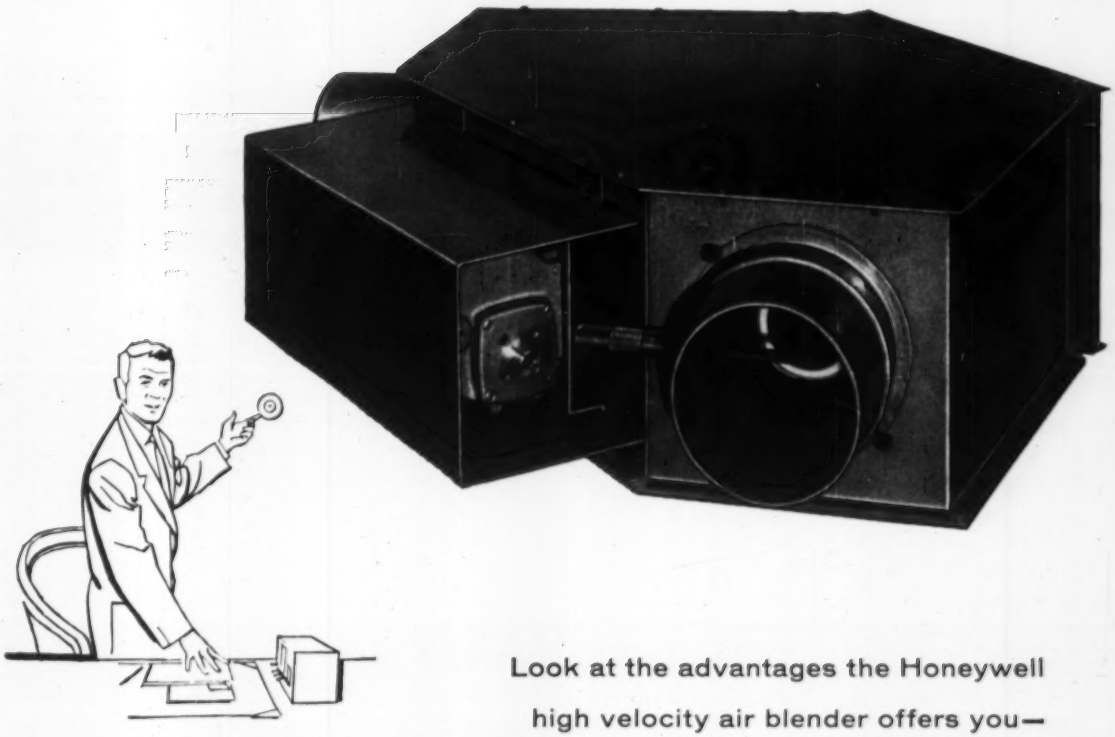


"Y" Unit (as illustrated on the opposite page)—this is the conventional packaged unit supplied by Honeywell.



Under-the-Window Installation—the air blender valves and regulators are designed to fit *any* mixing box.

high velocity air blender



Now your clients can offer complete air conditioned comfort, thermostatically controlled by the occupants to suit their individual needs. With a Honeywell Air Blender serving each room the whole system is always in balance despite widely varying room demands. Even unusual conditions—such as those caused by a building being shaded on one side and heated by the sun on the opposite side—will not upset the system.

Look at the advantages the Honeywell high velocity air blender offers you—

1. **"Dial" air balancing**—easy to balance system that enables the architect and engineer to make subsequent changes without disturbing the rest of the system, thereby eliminating a major disadvantage of conventional double-duct systems.
2. **Controlled volume of air**—from both hot and cold ducts independently; regardless of changing demands from other parts of the system—unlike conventional methods.
3. **Constant CFM from each unit**—means elimination of noise and draft problems created by changing flow.
4. **Long valve life**—gives lower maintenance costs because of absence of linkage.
5. **Simplified central system control**—a by-product of the other advantages because you don't need constant static system pressures.

For further information about Honeywell High Velocity Air Blenders and other Honeywell heating and air conditioning products, call your local Honeywell office or write Honeywell: Dept. HA-12-297, Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

112 offices across the nation

First in Controls

Sterling, secretary of the Building Managers' Association of Chicago.

At the end of the program, Mr. Hieronymous was presented with a book, movie, and tape recording of the show. ‡

HPAC Index for 1956 Available Soon

. . . for free copy, write editor

FOR YOUR convenience the editorial contents of HPAC, including the Journal Section of the American Society of Heating and Air-Conditioning Engineers, are indexed annually. The 1956 index is now in preparation and will be available early in 1957 to subscribers on request.

To obtain your free copy, write the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2, Ill. ‡

UA, Sheet Metal Workers Agree on Jurisdiction

. . . for heating, air-conditioning

AN AGREEMENT between the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry and the Sheet Metal Workers' International Union has been signed which clarifies the areas in which each will work for the installation of: a) cooling, heating, and air conditioning units, b) room radiators and enclosures for heating purposes, c) kitchen equipment.

The new agreement identifies whether the work is primarily piping or sheet metal. Where both crafts are equally concerned, it specifies that composite crews are to be assigned. Where these composite crews are required by agreement, both unions promise to provide the contractor having the installation contract with a sufficient number of men under the prevailing wages and working conditions in the locality.

Also, the two union presidents — Peter T. Schoemann for the UA and Robert Byron of the SMWIA — have agreed that "No disputes which might occur between our respective affiliated local unions will be sent to the National Joint Board for the Settlement of Jurisdictional Disputes." If the dispute cannot be resolved by local union representatives, it will be passed along to international representatives, and then on to the general officers of the unions if necessary. ‡

Engineer Societies Sign Contract for Plans

. . . for new center

UNITED Engineering Trustees, Inc., the joint corporate agency of the four major national engineering societies, has signed a contract for preliminary architectural plans for a new engineering center in mid-Manhattan, New York, according to the UET.

The four societies are The American Society of Mechanical Engineers, the American Society of Civil Engineers, American Institute of Mining, Metallurgical, and Petroleum Engineers, and the American Institute of Electrical Engineers. ‡

"QUOTE"

"Air conditioning is a good investment which will amortize and earn handsomely if an adequate job is planned, capable of satisfying the requirements of any particular building. It is a vital rental necessity now. Too long postponement of acquiring it will lose tenants — generally the choicest — to air conditioned buildings."—*Murray E. Randell, Sr., Hooker and Randell, building management firm, speaking before the north central regional conference of the National Association of Building Owners and Managers recently.*

Construction Declines Seasonally in October

. . . to $4.1 billion

OUTLAYS for new construction declined seasonally in October to $4.1 billion, according to preliminary estimates prepared jointly by the U.S. Depts. of Commerce and Labor. Nevertheless, this figure was slightly above the previous October high set in 1955.

Most major construction categories except for private housing continued strong. Expenditures for private industrial plants, public utilities, office buildings, churches, and public schools were at an alltime October high.

On a seasonally adjusted basis, new construction activity thus far in 1956 has been at rates which indicate this year's total will exceed $44 billion, $1 billion more than last year. ‡

American Named First President of World Group

. . . to study climate and man

FREDERICK SARGENT II, of the department of physiology, University of Illinois, Urbana, was elected first president of the newly organized International Society of Bioclimatology and Biometeorology at its recent meeting in Paris.

As defined by the Society, "Bioclimatology and biometeorology comprise the study of the direct and indirect interrelations between the geophysical and geochemical environment and living organisms, plants, animals, and man."

Some 60 scientists from 15 nations attended the three day administrative and scientific sessions. Total membership is about 325.

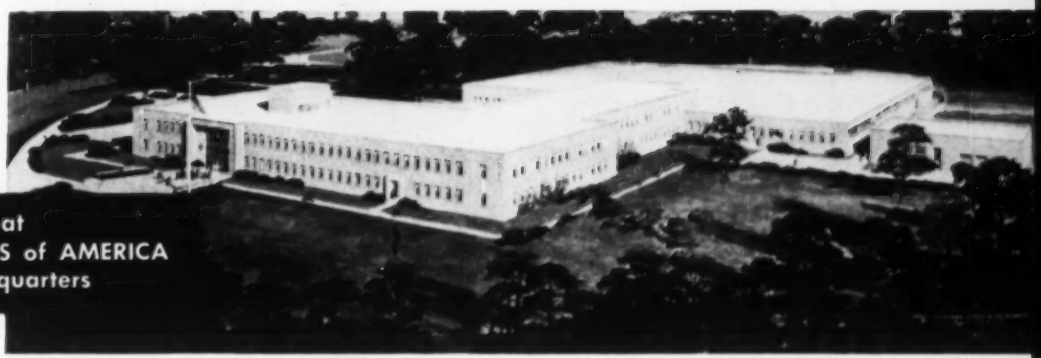
Dr. Sargent was chairman of the committee on bioclimatology, American Meteorological Society, 1951 to 1956, and at the present time is a member of that committee. Also, he is consultant to the subcommittee on meteorology, committee on aerobiology, American College of Allergists. ‡

NEW HORIZONS

in Heating Comfort

at
CORNELL UNIVERSITY

CHAPMAN, EVANS & DELEHANTY
ARCHITECTS AND ENGINEERS
50 Broadway, New York 4, N. Y.



at
BOY SCOUTS of AMERICA
Headquarters

A new concept in comfort heating is finding expression in buildings designed by America's foremost architects and engineers.

It's Webster Forced Hot Water Tru-Perimeter Heating featuring continuous bands of warmth along each exposed wall, simplified piping, fewer risers, more room in every room.

Webster Tru-Perimeter Heating using Webster Walvector provides gentle, uniform heat in six new dormitories at famous Cornell University where quality heating and low operating cost were major considerations. Chapman, Evans & Delehanty, New York, one of the oldest firms in its field, were the architects and engineers. Jamieson-McKinney Co., Inc., of Ithaca, made the heating installation.

Another Chapman, Evans & Delehanty design, using Webster Walvector in Tru-Perimeter arrangement, is the new Boy Scouts of America Headquarters Building in New Brunswick, N. J. The heating installation was made by The Frank McBride Co., Paterson, N. J.

For more information on Webster Walvector, call the Webster Representative or write us.

Address Dept. HP-12

WARREN WEBSTER & COMPANY
Camden 5, N. J. : : Representatives in Principal U. S. Cities
In Canada, Darling Brothers, Limited, Montreal

Webster
WALVECTOR
REG. U. S. PAT. OFF.
For Steam or Hot Water Heating

For the Starr Elementary School . . .

Wind·o·line Radiation makes the difference!

The Starr Elementary School of Richmond, Indiana, installs a Nesbitt Series Hot Water Wind-o-line System of heating and ventilating for only $1.28 per sq. ft. The Wind-o-line radiation is concealed in Nesbitt storage cabinets and serves as the only required supply and return for the Syncretizer unit ventilators. Construction, equipment and installation savings are estimated at $20,000.

This is a fact: Indoor thermal comfort is related not only to the temperature of the surrounding air, but also to the temperature of the surrounding surfaces . . . *therefore:* The heating and ventilating system for today's classrooms must be able to supply heat all along the cold window wall—*whenever and for as long as needed*—to protect against excessive radiation of body heat to the cold surface, and to divert the chilling downdraft from pupils sitting near it. This provision must be *in addition* to the unit ventilator's function of heating, ventilating and cooling the classroom. Of existing systems, only the Nesbitt Syncretizer with Wind-o-line Radiation provides this complete protection. Large savings are effected by using Wind-o-line's copper tubing as the supply and return for a series of classroom units; but Wind-o-line Radiation is much more than a system of piping. It is an essential contributor to the Nesbitt System—which creates *the thermal environment most conducive to learning.*

Architects and Engineers:
R. W. CLINTON & ASSOCIATES
Richmond, Indiana

Nesbitt heating and ventilating gives you
MORE LEARNING PER SCHOOL DOLLAR
Write for further information

Nesbitt

SERIES WIND·O·LINE SYSTEM

Made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa. Sold also by American Blower Corporation and American-Standard Products (Canada) Ltd.

"Open for Discussion"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Sprinkler Piping Not Welded Because of Fire Hazard

P.J.R. WANTS TO KNOW — Question of the Month, September HPAC — why joints of sprinkler piping are not welded. He has been advised, he says, that this method of fabrication offers a fire hazard even though other systems may be welded when located a short distance away. Other reasons offered are: a welded joint may break during a fire and welded piping offers greater resistance to water flow.

Here are a few thoughts in addition to the answers of other readers published in the October HPAC.

National Board of Fire Underwriters Publication NBFU No. 13 (August, 1955), defines requirements for design, construction, and installation of sprinkler systems. Paragraph 521 (e) specifies joints in risers and mains, which may be welded for special cases if permission is obtained from the governing agency having jurisdiction.

The above rule is very flexible, leaving the ultimate decision to the local authorities and/or insurance underwriters. Although welded risers and mains are allowed by some governing agencies, there is less acceptance of this type of fabrication for headers and branches. The reason is that frequently a sprinkler system is changed to meet requirements of building expansion or renovation. With welded assemblies, it is necessary to cut certain pipes and joints and weld the new construction with gas and/or electric torches. Because of these modifications, the sprinkler system is inoperative. Thus a fire hazard exists during the changeover without a water supply being available for fire protection.

Welding other piping in the immediate area is usually permitted because the sprinkler system is still in working order ready for duty.

H. B. WAYNE
Consulting Engineer
Woodhaven, N. Y.

Report Tells How to Design Simple "Garden Nozzle" Stack Spray

IN THE ITEM, *Report New Ways to Reduce Air Pollution*, published in The Editors' Pages in the July HPAC, reference is made to a report of tests in the Bituminous Coal Research, Inc., laboratory in Columbus, Ohio, showing that stack spray dust collectors can collect 60 to 70 percent of the suspended fly ash and dust emitted from coal fired boilers.

It has occurred to me that readers might also be interested to know that the BCR report on stack spray dust collectors provides for the first time some valid, simple design criteria for an inexpensive "garden nozzle" stack spray to knock down large soot and fly ash when flues are blown from small and medium moderate sized boilers that are not equipped with fly ash collectors. The "garden nozzle" stack spray can also be used when cleaning out the base of a stack or chimney.

A lot of "spitting distance" nuisance can be abated with this simple device.

BENJAMIN LINSKY
President, Air Pollution Control Association
Chief, Detroit Smoke Abatement Bureau

Simplicity of Installation, Other Reasons Favor Screwed Sprinkler Pipe

IN THE SEPTEMBER HPAC, P.J.R. asks *Why Can't Sprinkler Piping Systems Be Welded?* Actually, there are several reasons for using screwed pipe rather than welded, as pointed out in several answers in the Question of the Month pages in the October HPAC. I would like to make a few additional comments of my own that may be of help.

On existing structures, where welding overhead is impossible from a fire hazard standpoint, screwed pipe is the only solution, in my opinion.

Older buildings, such as clothing stores, offices, etc., are prime examples of this type. On construction of new buildings, where welding of sprinkler piping presents no more hazard than would welding of steam piping, screwed piping has as its advantage simplicity of installation.

All mains, laterals, and branches are precut and threaded in the shop. Since the sprinkler heads themselves have threaded bases, it would be necessary to use adapters from welded pipe to iron pipe to mount the heads, if welded pipe were used.

Actual installation of the precut pipe requires no special tools, and proceeds at a rapid rate using screwed pipe. Mains and branches reduce in size successively with concentric reducers. It would be possible to weld only 20 percent of the installation at best.

Sprinkler companies recommend that a system be opened at ends of all mains and branches for back flushing after a system has reached half life — about 25 years. This would be impossible in a welded system.

GEORGE R. DIEGLE
Plant Engineer
Marion General Hospital
Marion, Ohio

Solar Collector-Heat Pump Design Challenged as to Economic Soundness

I READ with much interest the article, *Solar Collector and Heat Pump Heats, Cools New Office Building*, by Roger W. Haines in the October HPAC.

I am pleased to learn that another solar heated building has been erected. The author and his firm, Bridgers and Paxton, consulting engineers, apparently feel that our greatest need in the development of solar heating and cooling is the actual construction and testing of full scale equipment in typical structures. In addition to the technical information thus learned, much needed economic data can be secured.

However, the author's statement that the building is completely solar heated seems inaccurate. The use of electric energy to operate a heat pump, even though the source of heat for the heat pump is completely solar, is strictly analogous to the use of auxiliary fuel. His argument could be carried to the ridiculous extreme of claiming a building is completely heated by outdoor air if an air source heat pump is being used. In this field of development, where exaggerated claims are all too common, it is to be hoped that technical authors will neither purposely nor unintentionally mislead readers.

Also, I do not believe the author is justified in claiming that the design is economically sound, in the absence of supporting data, on the very rough basis that the entire building will cost approximately the same as a comparable building with complete year 'round air conditioning. In my opinion, too many factors enter the comparison, and only a realistic evaluation of heating and cooling costs by competitive systems will be convincing.

The author does not mention the possibility that the water storage tank might not have enough heat capacity to supply even the heat pump under all conditions. A prolonged period of cold or cloudy weather, on the basis of a rough calculation by this writer, would completely exhaust the heat from the storage tank, above 35 F. It is presumed that under these conditions, an auxiliary water supply would serve as the heat source for the heat pump. Weather Bureau records, at most stations, show temperature and solar extremes at intervals often much greater than 3 years, the period used by the author for design in Albuquerque.

The choice of a collector tilt 30 deg from the vertical and use of a radiation factor 2.3 times that received on a horizontal surface appears sound, assuming that the factor applies only to the months of December and January.

A final point concerns the approximate calculations by which heat deficiency and water storage requirements were determined. Experience has shown that collector efficiency is more dependent on temperature difference between operating and ambient temperatures than on the operating temperature itself. Since the design was based on a day by day calculation anyway, a somewhat more realistic solar heat recovery figure could have been obtained by applying daily collector efficiencies which were determined as functions of temperature difference between collector temperature and average daytime outdoor temperatures.

GEORGE O. G. LOF
Chemical Engineering Consultant
Denver

The Author's Reply —

WE CERTAINLY APPRECIATE Mr. Lof's considered comments, although, naturally, we don't entirely agree. I would like to clarify our position on some of the points.

The question of whether the use of a heat pump is or is not analogous to the use of auxiliary fuel may be debatable. Certainly, we need to use electric power to operate the machine. On the other hand, the actual source of the building heat is the solar collector, the heat pump serving merely as a device to raise it to a usable level. A good argument can be made for either point of view. Ideally, we should add some solar batteries to operate the heat pump, and thus avoid argument. This will probably be possible in the future. It is certainly not our intention to mislead anyone.

On the matter of economics, again there is room for debate. However, I endeavored to avoid any claims, merely stating that it was our "optimistic conclusion" that the design is economically sound. This can only be definitely determined by a careful economic study after we have obtained some operating data.

The water storage was probably the most carefully considered part of the system. Since the design was made, we have an additional two years' records which have been checked. Also, sunshine and deg day data for previous years were compared, even though solar radiation data was not available. We feel that we have a sufficient factor of safety here to cope with even an unusual situation. Incidentally, there is a very good correlation among sunshine hours, solar radiation, and deg days for Albuquerque, which, if it holds true for other localities, might allow sunshine hours to be used as a design basis in the absence of solar radiation data.

The assumed collector efficiencies are based on an average daytime outdoor temperature of 35 F, which is the monthly normal for Albuquerque in December and January. This could have been refined by using the actual temperature data from the Weather Bureau. This would have involved considerable additional calculation, which did not seem justified, since there is only a small error involved. We are, however, planning to make operating calculations on the basis recommended by Mr. Lof.

ROGER W. HAINES
Bridgers and Paxton
Consulting Engineers
Albuquerque

what they're saying about
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WATER TUBE

"It's the perfect answer for Air Conditioning Lines in existing buildings like the SOUTHWESTERN BELL TELEPHONE COMPANY,"

Says Allen Sodemann, General Manager
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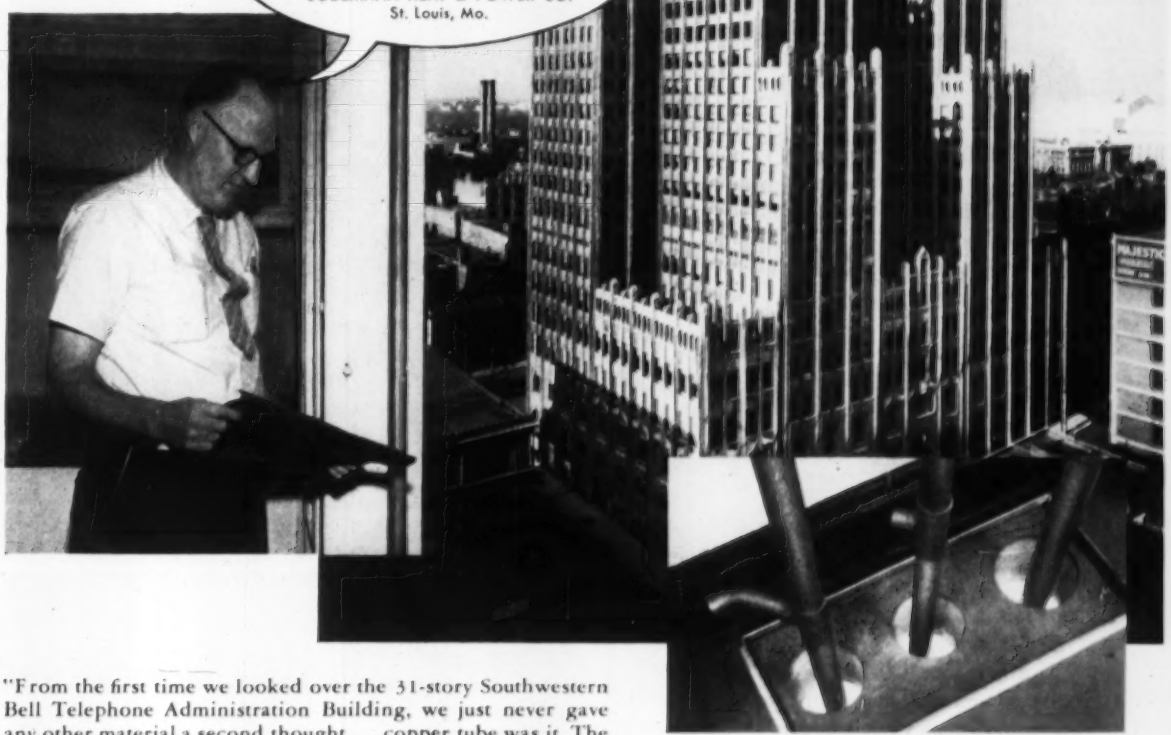

ADMINISTRATION AND EQUIPMENT BUILDING OF SOUTHWESTERN BELL TELEPHONE COMPANY, ST. LOUIS

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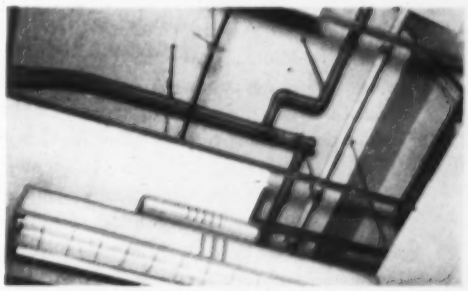
ONE OF THE 1,101 SETS of risers around the perimeter of the building. Using solder fittings with silver alloy brazing made installation speedy, safe, sure.



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Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility, permitting addition of radiation without changing basic pump installation.
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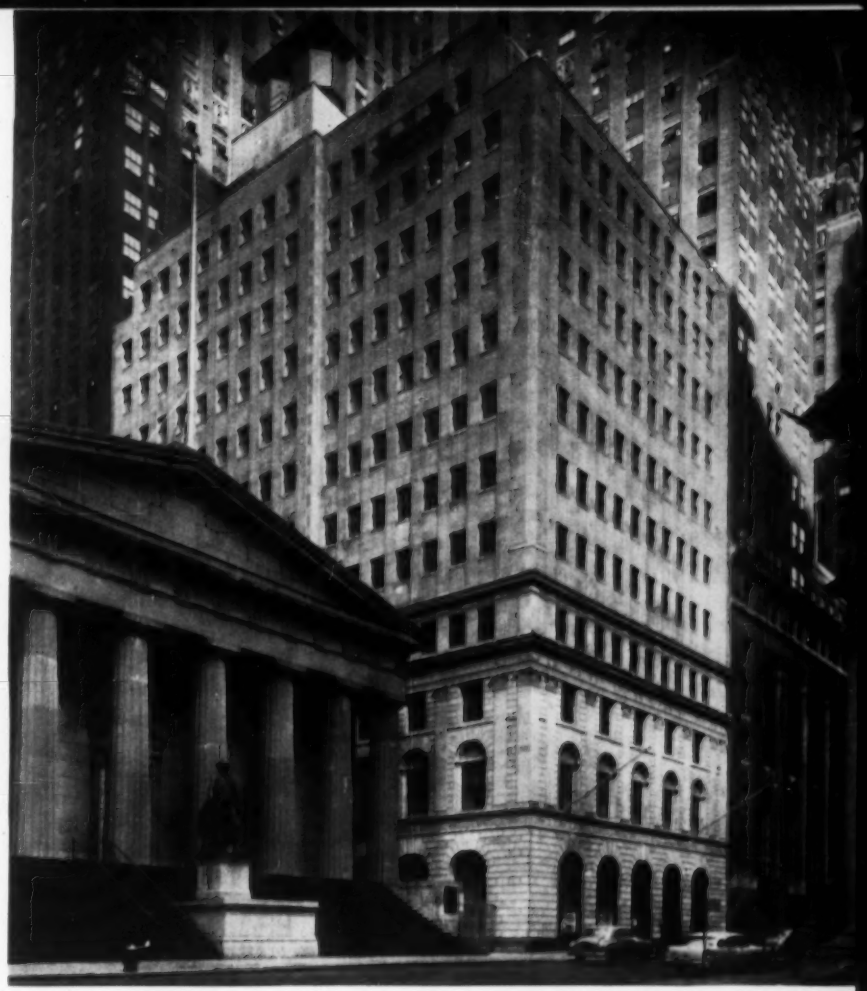
. . . to eliminate chronic complaints caused by various factors,

. . . to obtain satisfactory interior conditions automatically,

. . . to permit individual control in each room or space . . .



High Pressure Double Duct System Heats, Cools New Seamen's Bank

— first complete installation of its kind in New York

BY EDWARD E. ASHLEY
Consulting Engineer

A HEATING-COOLING "first" was chalked up in New York City recently with the completion of the new 12 story headquarters building of the Seamen's Bank for Savings at 30 Wall Street on the site of the famous old U. S. Assay Office. It is the first large building to be erected on Wall Street in 30 years.

It is the first structure in the city for multiple office tenant occupancy to have a double duct high pressure heating-cooling exterior zone system throughout.

State Reasons for Choice

The need to have a year 'round air conditioning system embracing extreme flexibility, maximum dependability and performance, and prudent first cost focused design considerations on these factors. These objectives, however, challenged ingenuity, since the building planning presented unusual structural and architectural limitations resulting particularly from the decision to preserve the old facade.

The prime criterion of air conditioning system performance necessitated developing a heating and cooling system which would eliminate the chronic complaints, especially in office buildings, arising from varia-

EXECUTIVE OFFICE AREAS have medium pressure air mixing units recessed in walls under finished sills. All air type of system was chosen after careful studies

PUBLIC SPACE of main area is on first floor. This area has a separate air conditioning system, with supply diffusers and returns in ceiling

tions in exposure of the various rooms, variations in the heat and cold reactions of individuals, and the population density of each room.

It was further desired to obtain satisfactory interior conditions automatically without the necessity for frequent adjustments in such varying types of rooms as conference rooms, rooms using many IBM machines, small individual offices, large secretarial offices, board rooms, kitchens, cafeteria, private dining rooms, and the huge expanse of public banking space on the first two floors and basement area.

Modern building design presents considerably different heating and cooling conditions and problems than formerly. Modern space planning provides for a more dense population per square foot — two or three times more than in former years — with population varying continuously throughout the day. This fact, which in itself had great influence on air conditioning, presents a continual problem of meeting the rapidly changing rate of heat gain or loss.

It has been recognized for some time that the public is becoming increasingly more demanding on the quality of air conditioning and that all individuals do not find the same temperature and humidity conditions comfortable, notwithstanding recognized established standards. Research by our office indicates that the majority of people — mainly because of lighter clothing in use today — prefer 74 to 76 F in winter. In summer, 25 to 30 percent of the people prefer 75 F, 50 percent relative humidity with 95 F outside. These persons apparently have no particularly unfavorable physical reaction afterwards. In contrast, others suffer cold or distressing reactions from such wide changes.

It was therefore important to develop a method of air conditioning to permit individual control in each room or space which would be completely automatic, draft free, and operate at a low sound level, an essential feature in modern building design since quieter work areas, cheerful, illuminated and comfortably conditioned contribute materially to the well being and efficiency of the occupants.

System Has Many Advantages

Careful surveys and analysis of the varying conditions influencing this project indicated that the high pressure, double duct system of heating, air cooling, and ventilation best fulfilled the requirements.

At the Seamen's Bank, the floor-to-floor elevations were fixed to match the adjacent building to facilitate the possibility of future interconnection. Furred space available in the hung ceiling is limited and critical; thus the smaller duct dimension contributed much in maintaining satisfactory finish ceiling height.

Use Steam Turbine Compressor

A 350 ton steam turbine driven centrifugal refrigeration compressor and the water chillers and attendant plant auxiliaries are in the basement of the building. Consolidated Edison Co. steam is utilized for heating as well as driving the refrigeration compressor during the cooling season. Analysis showed it would be more

economical for the bank to purchase steam from the utility company than to generate its own and the steam turbine drive provided better economy in operation than an electrical drive for this installation. The steam turbine operates at 125 psig with 26 in. vacuum holding at 15½ lb of steam per ton of refrigeration at maximum load.

Condenser water for the turbine and refrigeration cycle is obtained from a cooling tower on the roof. The 1400 gpm tower is equipped with sound and vapor controlled baffling to eliminate the complaints of tenants of nearby tall buildings. Primary condenser water is pumped from a deep well on the premises at 72 F through bearing oil coolers, thence up to the cooling tower for makeup. The compressor refrigeration plant in the basement supplies chilled water to the primary fan rooms. The combined pumping horsepower of the deep well water pumps and the chilled water and condenser water pumps total 145 hp.

The subbasement equipment room presents one of the most colorful areas in the building. A stickler for good housekeeping, the bank has followed through with seamen-like precision in color coding all mechanical equipment and piping. The mechanical equipment was literally fitted into the equipment room similar to a seagoing destroyer, yet it provides surprising access for maintenance.

Design Separate Air Systems

The interior zones on each floor are subject to the ranges of internal load fluctuation with little external wall load changes. A low pressure supply and return air system was fitted into the furred space. Each individual floor is handled with a separate suspended unit conditioner, served from a high pressure dual duct air handling station in penthouse or basement. Zone reheat coils are placed in the duct discharge. These are thermostatically actuated by a return air thermostat.

The main banking space is supplied with a separate air handling system to meet the unusual load variations in the public space. An overhead system of supply and return diffusers were fitted into an elaborate cast plaster ceiling.

The roof penthouse contains two air handling stations to serve the individual perimeter systems. These high velocity systems blend circulated air and outside air in response to a return duct controller. Primary air is filtered through selfcleaning automatic oil bath filters to reduce maintenance. Preheat coils are sized for the minimum outside air bank.

Heating and cooling coils are at the fan discharge. A steam reheat coil is modulated by a discharge temperature controller to maintain the hot duct setting at approximately 132 F during the winter. A static pressure regulating damper is after the coil. The cooled air is supplied through a deep chilled water coil modulated by a duct controller to maintain a temperature of 53 F.

One supply fan delivers conditioned air to the bank occupied areas extending from the first through the sixth floors. This supply fan has a 30 in. diameter fan wheel and moves 18,000 cfm at a total fan static pressure of 6.9 in. WG.

The second supply fan provides conditioned air throughout the tenant occupied spaces on the seventh through the 12th floors. This fan has a 33 in. diameter fan wheel and provides 26,000 cfm at a total fan static pressure of 6.0 in. WG.

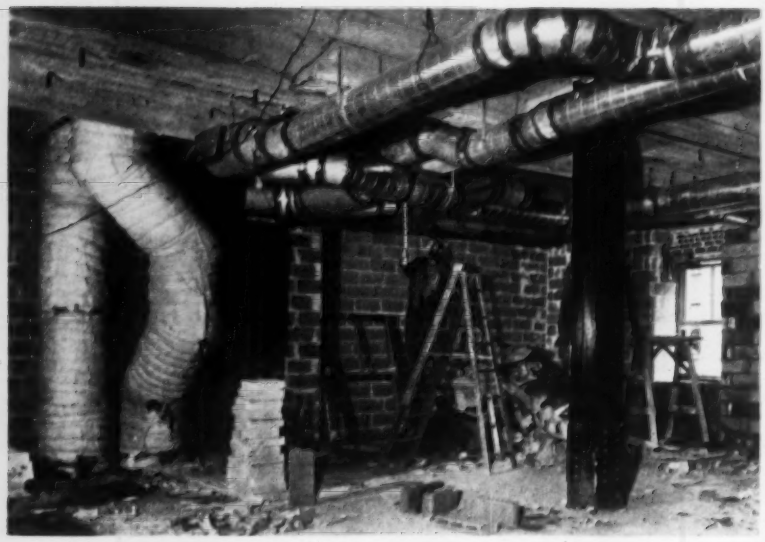
Flexibility is maintained in operating the air conditioning equipment by divorcing the bank from the requirements of the tenant spaces.

The main vertical downducts from the fan penthouse are in a duct shaft in the service core of the building. The cold air ducts are each 27 in. in diameter. The heated air ducts, 23 in. in diam, each supply 75 percent of the air. The high velocity ductwork was designed to supply air at velocities up to 5000 fpm. The ability to reduce the size of the ductwork, as the result of the increased velocity and temperature differential permitted a greater latitude in the placement of the primary air conditioning equipment.

Horizontal runouts from the main duct are installed in the 12th, ninth, seventh and fourth floor hung ceilings. This branch ductwork is looped around the perimeter of the building.

Smaller duct risers are installed in furred columns around the building exterior. These risers are connected to the horizontal ducts in the several hung ceilings. The installed sections of the ductwork were capped and tested for leakage before

PERIMETER MIXING UNITS are connected to branch risers by flexible hot and cold ducts. Risers supply air to three floors. Face linear diffusers eliminated problems of sill type diffusers



BRANCH DUCT LATERALS are connected to vertical risers on each floor. Space saving smaller ducts permitted floor-to-floor elevations to be matched with adjacent building

being tied into the mains. The duct-work was tested with 6 in. static pressure; the leakage volumes were measured through an orifice on the duct testing fan. All main ducts and duct connections were made completely air tight.

Wall Units Mix Perimeter Air

Medium pressure, wall located air mixing units are installed beneath each window around the building perimeter. The individual risers supply air to three floors. The air conditioning unit damper mechanism is positioned by a pneumatic motor to supply varying amounts of heated and cooled air. As the damper closes, the cold damper opens a like amount to provide linear control.

Room thermostats are internally installed in approximately 30 percent of all units to provide temperature control. The capillary bulb on the thermostat is positioned behind the induced air grille to provide an accurate sensing location. Pneumatic motors in several wall units are positioned from a single thermostat.

The wall unit induces room air into the lower half of the linear diffuser with an orifice and venturi. Primary air and room air are intimately mixed prior to discharging from the upper half of the grille. The total air stream is deflected vertically away from the room occupants to minimize drafts and temperature inequalities. Residual air motion of 25 to 35 fpm is created throughout the perimeter zone area. The vertical air pattern reduces the convection and radiation exterior heat losses in the winter and heat gains in the summer. By utilizing face linear diffusers, window sills are maintained clear.

Emphasize Sound Control

Considerable emphasis is placed on sound control in this building. Acoustic plaster or acoustical tile ceilings are installed throughout. The perimeter offices were to a very large extent completely carpeted. Many office interiors are complemented with window draperies.

The sound control of the air distribution system was critically reviewed. Sound mufflers are installed in the discharge of the primary air fans. The silencers absorb a large portion of the low frequency fan spectrum. Further sound attenuation was calculated throughout the duct system at all elbows and branch connections. The individual air conditioning units attenuate the balance of the primary system noise.

The duct design is a critical member in the acoustical design of the system. The duct can attenuate noise if properly designed; it can regenerate sound energy if improperly designed and installed. The sound power created by the high static pressures entering the air conditioning units is reduced to provide an operating sound level throughout the more quiet areas of the building of 29-42 db. This level is primarily residual background space level, and not attributable to the air conditioning system.

Prefer Cooler Room Conditions

The building was occupied throughout the entire summer of 1955, which was one of the most severe cooling seasons of recent years. The ensuing winter provided a severe heating load where a 6 percent above normal heating load was encountered. The air distribution system has provided a high degree of individual room control. The air distribution within the occupied space has been comparatively free of the usual draft complaints. Residual air motion has been proven extremely satisfactory.

A survey of the space temperatures during this time revealed wide latitudes in individual preference, as previously discussed. Although a broad range of space temperatures were measured in the summer months and in the winter months, it was definitely established that cooler space temperatures were preferred than the acceptable standards of the past 10 years. The double duct all air system proved capable of providing the wide control to satisfy the individual temperatures and air distribution requirements.

The heating and air conditioning contractors were Alvord & Swift. The general contractor was the William L. Crow Construction Co. The architects were Halsey, McCormack & Helmer. ≠

The Law and Your Profits

BY WILLIAM HURD HILLYER

Court Defines "Contractor"

. . . also "general contractor," "subcontractor," and "improvements," which include heating, piping, and air conditioning

A CLEAR UNDERSTANDING of the legal definitions of "general contractor," "subcontractor" and "improvements," as handed down by one state court recently, may well prove an asset to readers in future negotiations, as the following case shows.

The city of Prospero entered into an agreement with Will Pypinstall, piping contractor doing business as Pypinstall Construction Co., to install piping and to do related work in an "overall improvement plan." Project No. 2 under the plan was entitled "Pipe Line;" Project No. 4, "Clearing Area."

Concerning the latter, it was provided that "the contractor may determine for himself the method in which he shall destroy or remove the timber . . . and shall have the privilege of clearing the land with bulldozers or similar equipment."

Pypinstall submitted Project No. 4 to Cleregood Bros. as subcontractors. That firm undertook to clear the project area according to specifications: 225 acres at $143 per acre plus the cut timber. The specifications required only that the trees be cut a short distance from the ground. The removal of stumps was not contemplated. No grading nor moving of dirt was indicated. Blasting was permitted, but under strict local regulations.

A few weeks after the Cleregoods began work, a lumber company made claim to the timber. Interested parties being unable to agree on the ownership of the timber, Pypinstall notified the brothers to stop all work and leave the area. The Cleregoods complied with that demand and shortly thereafter brought suit against Pypinstall to recover $27,000 damages for alleged breach of contract.

Contractor Had Not Registered

Defendant Pypinstall moved that the suit be dismissed. The subject contract, he declared, was "unlawful and void." He asserted that it was unlawful and unenforceable because the Cleregoods' undertaking was in excess of $20,000 and they had not registered with the State Registration Board of Contractors as general contractors or subcontractors under statutory requirement.

The trial court held that Cleregood Bros. were subcontractors within statutory meaning. Since admittedly they had not qualified as either general contractors or subcontractors and the cost of the work to be performed was more than $20,000, the court dismissed the action.

On appeal the higher tribunal reversed the lower court's decision. The statute was derogatory to common law, the learned justices ruled, and therefore may be strictly construed. Under such construction, the higher court held, the statute was not applicable because the plaintiff Cleregood Bros. was not a general contractor or subcontractor.

Court Defines Terms

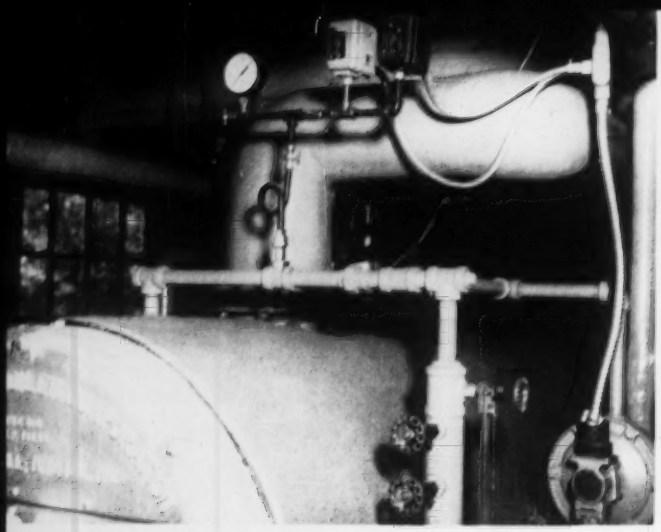
In the course of its opinion, the following definitions emerged:

The word "improvement" is a comprehensive term which includes in its meaning any "valuable addition" or development whereunder work is done and money expended "for the future benefit or enrichment of the premises." Constructing a building — or installing heating, piping, and air conditioning equipment therein — is making an improvement. However, says the higher court: "'Improvement' is not a word of art having a fixed and definite meaning. It takes color and significance from the surroundings and must be interpreted and given the meaning indicated by its setting."

"General contractor" or "subcontractor" means any person, firm, association, or corporation that for a fixed price, fee, or percentage orders or contracts for performing or superintending any work on or in any building or structure requiring the use of paint, stone, brick, mortar, wood, cement, structural iron or steel, sheet iron, galvanized iron, metallic piping, or other metal. Included also are electric wiring and any work involving the installing, altering, or repairing of any piping or steam fitting. Outdoor work such as paving or excavating comes likewise under the definition, said the court in its ruling. ✠

WILLIAM HURD HILLYER, *author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. He has an extensive practical legal and financial background.*

This series presents actual cases. Naturally, laws vary in different states. All names are fictitious.



Boiler Annunciator Flashes Outages

BY TOM D. B. THOMAS

Superintendent of Boiler Operations
U. S. Naval Ammunition Depot
Crane, Ind.

Visual-audible signals on a central panel report interruptions in operation of over 70 boilers serving isolated plants in this 100 sq mile ammunition depot. Any boiler outage is sensed by a second pressure control on steam boilers and a second immersion thermostat on hot water boilers. The secondary controls actuate in each boiler room a normally open, a-c operated relay. Upon closing, the relay completes a 52 volt d-c telephone circuit and activates the signal light and sound alarm for the identical station on the panel.

To ASSURE uninterrupted steam and heat service at the Naval Ammunition Depot, Crane, Ind., a boiler annunciator system has been devised whereby interruption of the operation of unattended boilers is immediately signalled to a central control station so that personnel can be dispatched to correct the trouble without delay.

The depot is a vast area of about 100 sq mi. Various production plants, strategically isolated from each other for protection in case of disaster, have their own individual steam generating or heating plants.

Also, continued expansion of the base far beyond the original intent has resulted in a large number of individual building heating plants, which — if the expansion could have been foreseen — could have been better consolidated in one large central plant with an underground distribution system.

Most Boilers Unattended

The majority of the boilers — there are 103 of miscellaneous types and capacities — are fully automatic, including electronic combustion controls. These automatic boilers, regardless of type, capacity, or kind of fuel used, are so equipped that the water level within them is regulated automatically; the fire in them is regulated automatically by the pressure of and/or demand for steam; the fuel supply is automatically cut off in the event of low water in the boiler, excess steam pressure, malfunctioning of the firing unit, ignition failure, etc.

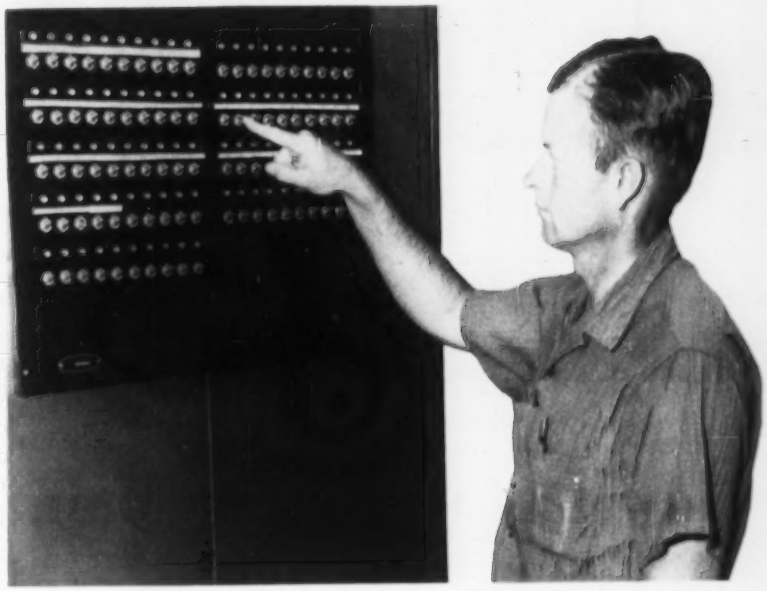
In eight boiler rooms 21 boilers have 'round the clock attendants, but 71 of the boilers in 53 separate locations are unattended. All operating boilers are in service 24 hr per day, seven days per week, October through May, with operation limited as required during the rest of the year.

Any fired pressure vessel is a potential hazard when in operation. Therefore, it is essential that a checking program of the unmanned boilers be maintained for safety. Such boilers without regular attendants have to be systematically checked to insure that automatic devices are functioning correctly, that the flame failure controls will cut the burner out in case of ignition interruption to prevent flashback or flame explosion, and that in case of low water the controls will cut off the fuel supply and so prevent boiler damage or even explosion.

These programmed checks of operating plant essentially have to be curtailed to a minimum on account of the time involved, the very limited personnel available for the work, and the considerable amount of travel — about 35 mi — necessary to visit all such installations, as some installations are 6 mi from the headquarters building.

It wasn't possible to check the boilers oftener than once every eight hours. Consequently, boilers functioning correctly when checked frequently developed trouble later and went out of operation. The results were loss of steam for processing and heating, with cold buildings and possibility of frozen facilities and pipe lines during severe weather. Such conditions occurring on weekends created situations which were dif-

System on Panel



ficult to cope with. So the signal system was devised and installed.

Boiler Controls Close Relays

Signals are relayed to the central location by the existing telephone facilities. At first it was decided to take the signals from the alarm relay on the combustion control panels, but certain unsatisfactory conditions led to the final plan of installing a second pressure control on steam boilers and a second immersion or surface thermostat on water boilers and taking the signal from them.

The primary pressure control and immersion thermostat start or stop the firing unit by pressure or temperature dictation. The additional pressure control is set at a lower pressure than the cut-in or start-up pressure, and the secondary immersion or surface thermostat is similarly set at a lower temperature than the cut-in temperature of the regular immersion thermostat. For instance, if the regular pressure control is set to cut the firing unit out at 45 psig and in at 40 psig, the secondary control is set to send the alarm in if the pressure drops to 38 psig; likewise, the immersion or surface thermostats.

There is therefore a reserve of steam or heat in the boiler when the alarm is relayed in. In most cases, the trouble can be corrected and the boiler put back in operation before the interruption is felt by the consumer. Time loss — boilers previously were often down many hours — has been drastically reduced and almost eliminated.

Signals Correct Own Errors

The actual panel unit consists of a 36 × 21 × 78 in. high steel cabinet, on the back of which is a 21 × 24 in. panel with a number of pilot lights and switches. Inside the cabinet are wiring and relays through which signals from boiler rooms are transferred to the respective audible and visual indicators on the panel board.

Each boiler room connected to the system has a normally open a-c operated relay which receives its power from the same source as the boiler equipment. When boiler operation is interrupted, this relay closes, thereby completing a 52 volt d-c telephone circuit and activating the signal light and sound alarm for the identical station on the panel.

The sound alarm switch permits the audible signal to be silenced for convenience, but the indicator light will continue until the trouble at the boiler room is corrected, when it goes off automatically. Switching off the audible signal at any one of several locations does not interfere with the sound signals of other locations.

If, at a boiler room, the load under certain conditions is near the boiler's capacity to generate steam, the demand might be so heavy that although the boiler continues uninterrupted, the pressure might continue to drop below the set signal pressure, thus simulating an outage. However, the signal will correct itself when the steam pressure or water temperature rises above the signal point. Such locations soon become known to the panel attendant, who will allow a correction period before declaring an actual outage at the location.

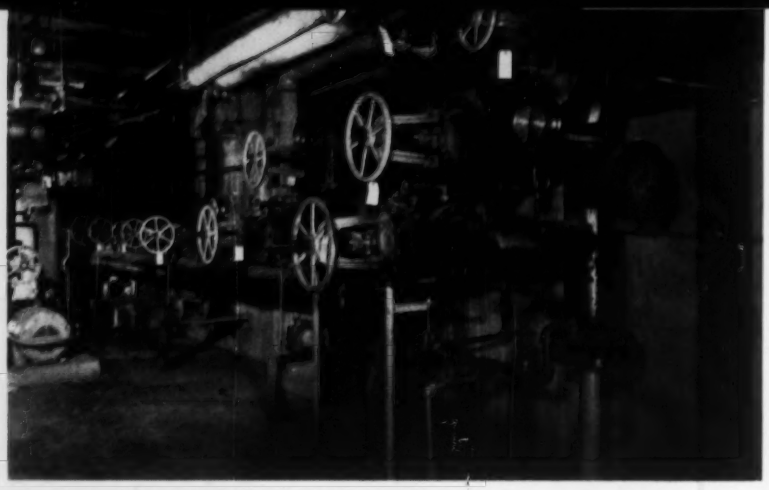
System Cuts Personnel

The signal system has effected considerable savings. In one area where eight boilers at separate locations supplied steam for heating a housing project, boiler room personnel was reduced from 14 to three. At another location, 'round the clock boiler attendants were completely eliminated.

The system is adaptable to any make or type of boiler — high or low pressure steam, or hot water — because the signal is actuated by the steam pressure or water temperature when it drops below set points.

The system has no value in controlling or governing the operation of the miscellaneous plants. Its chief value is that, in case boilers go out of operation, information is received without delay, enabling personnel to be radio dispatched to get the plant back into operation. It also permits using the limited available manpower to the best advantage.

The signal system has been in operation over a year, functioning well, with no maintenance beyond what could be normally expected. It was designed, constructed, and installed by the communications section of the depot's electric branch. ⧺



THE THOUSANDS of various types of valves, fittings, and allied products for all pressures, temperatures, and piping services, necessitate the knowledge of an unusually wide variety of metals and other materials

How to Cut Piping Maintenance Costs

BY ROBERT J. PINSKE

. . . in industrial plants by selecting proper piping materials and by comparing costs and advantages of threading and welding. Two other key factors in cutting costs were discussed in the November HPAC. Additional factors will be considered in future articles in this series, the result of a survey of 117 plants by the author.

3. Select Proper Piping Materials

THE COST of piping maintenance in industrial plants may be reduced in the design and installation of the system as well as in the actual operation and maintenance phases.

Pressures alone have developed no particular difficulties in pipe lines, provided the pipe, fittings, valves, and connections are of proper strength for the operating pressures. Steam pressures up to 2500 psig are in daily use. However, high steam temperatures have required much development of piping materials. Total steam temperatures of 1050 F and higher are used in central stations.

The tensile strength of all ferrous materials falls off rapidly after a temperature of about 600 F is exceeded. The phenomenon of creep — a slow, indefinite stretch of metal at high temperature — rises. If allowed to continue, creep results in rupture of the pipe. Carbon steels creep readily at high temperatures. Consequently, the use of carbon steels is limited to piping systems with total temperatures not exceeding 800 F.

Criteria governing the selection of piping materials for temperatures above 800 F are dimensional stability, corrosion resistance, and freedom from graphitization. All of these characteristics become of greater importance as temperatures increase.

Alloy steels must be used to meet these requirements. Molybdenum tends to lessen creep. Chromium increases corrosion resistance. Columbium and titanium improve the metallurgical stability of piping alloys. Piping for temperatures up to 1000 F may contain 2.25 percent chromium and 1.0 percent molybdenum.

The thousands of various types of valves, fittings, and allied products for all pressures, temperatures, and services, necessitate the knowledge of an unusually wide variety of metals and other materials. The most common, with their applications, are as follows:

Brass: Widely used for valves, fittings, and other products recommended for temperatures up to 450 F. It is an alloy of copper, tin, lead, zinc, classified as leaded red brass.

Bronze: A high grade alloy used in valves, fittings, and other products recommended for the higher pressures and for temperatures up to 550 F. It is classified as leaded tin bronze.

Nickel Copper Base Alloy: An alloy having a hardness superior to that of ordinary bronze. Its particular application is in seating material for valves which are to be subjected to services requiring the use of nonferrous trim, but where brass or bronze is inadequate. This particular alloy offers good resistance to wear

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and the corrosive action of dilute acids and alkalies, which are common on refinery sludge service, where various concentrations of sulfuric acid and alkalies are encountered.

Nickel Base Copper Tin Alloy: An alloy having excellent bearing qualities, corrosion resistance, and unusually good resistance to wear and erosion at steam temperatures up to 850 F. When used with excelloy alloy in valves, it is particularly satisfactory for steam, water, air, gas, and other nonlubricating and relatively noncorrosive gases or liquids, such as gasoline and fuel oil. Such valves are suited for oil having low viscosity and are used in hydraulic systems, especially where seating loads are extremely high.

Cast Manganese Bronze: When this alloy is used in valve stems, it will withstand great torsional and tensile strains to which this valve part is subjected. Its unusually good bearing qualities offer excellent resistance to wear, and this, combined with strength and the good corrosion resistance typical of copper base alloys, has extended its use to yoke sleeves, yoke bushings, and glands of iron and steel valves for a wide variety of services.

Cast Monel: A high strength nickel copper alloy, containing approximately two-thirds nickel and one-third copper. It has excellent resistance to corrosion by many acids, alkalies, salt solutions, food products, organic substances, and many other miscellaneous fluids. Among nonferrous alloys, monel is an outstanding material for handling solutions of the alkalies, and it is widely used wherever the avoidance of copper contamination is not imperative.

Nitri-Hard: A metal alloy used for plug type discs and seats in brass, bronze, iron and small size steel globe and angle valves. The parts are either forged or machined from bar stock. After machining they are heat treated to provide the desired hardness. This metal withstands high temperatures and offers unusual resistance to wear, cutting, scoring, erosion, seizure and galling.

Cast Stainless Steel: An alloy that has exceptionally high resistance to corrosion and finds wide application in many industries. Valves and fittings made of this material are recommended for use in services handling food products, as well as for a large number of industrial chemicals.

Hastelloy: An alloy trim used in chlorine valve discs, disc stem rings, and body seat rings. It is composed of an alloy of nickel, molybdenum, chromium, and iron. Its tensile strength and hardness are compatable to that of alloy steel. It withstands strong oxidizing conditions, such as those encountered with free chlorine and aqueous solutions containing chlorine.

Excelloy: An alloy of specially processed chromium iron. When used for valve stems, it is heat treated to provide superior strength and excellent resistance to tension, compression, shear, and other strains attending stem service. This metal withstands wear unusually well and offers liberal resistance to corrosion by atmosphere, mildly alkaline water, steam, gas, air, oil, and hot oil vapors. When excelloy is used for seating surfaces, it is further heat treated to secure a greater hardness. With this additional high hardness, it resists scratching, scoring, or indentation by hard particles and has excellent resistance to wear, seizure, galling, and erosion. It has a very high resistance to oxidation and to the corrosive action of hot sulphur bearing oils.

Cast Iron: Three grades, cast iron, ferrosteel and high tensile iron, generally recommended for temperatures up to 450 F. Cast iron is used for all small valves and fittings having light metal sections. Ferrosteel is used for sections of medium metal thickness. High tensile iron is used for the heavier metal sections.

Malleable Iron: Particularly suited for screwed pipe fittings, valves, and flanges. It is characterized by pressure tightness, stiffness, and toughness. The latter property is an especially valuable one for pipe line materials subjected to expansion and contraction, stresses, and shock.

Alloy Cast Iron: An alloy having better physical properties and resistance to corrosion when subjected to services where ordinary gray iron is not adequate.

Carbon Cast Steel: An alloy ideally suited for a multitude of services beyond the scope of bronze or iron. Its superior strength and toughness, and its resistance to piping strains, vibration, shock, freezing, and damage by fire afford reliable protection when safety and utility are desired. It is suitable for use on saturated or superheated steam, cold or hot water, cold or hot noncorrosive oil, gas, air, or other fluids.

Carbon Molybdenum Alloy Cast Steel: An alloy having many usually desirable characteristics. At room temperature, its strength is slightly greater than carbon cast steel, and this strength is retained to a marked degree at elevated temperatures. At temperatures up to 1000 F its resistance to creep is equal to that of the more highly alloyed steels. Unlike most alloy steels, its weldability compares favorably with that of carbon steel. It is admirably suited for use on steam, water, oil, gas, air, or other services when superior strength and toughness are essential. It is especially recommended for high pressure and high temperature service when valves and fittings are welded into the piping.

Chrome Molybdenum Alloy Cast Steel: An alloy used for high temperature service, particularly at 1100 F and higher. It has great strength and steam corrosion resistance. The chromium is added to stabilize graphitization under the operating conditions of welded power piping systems. This metal offers excellent resistance to erosion and to scaling at temperatures up to 1100 F. It is relatively economical in cost when compared with more highly alloyed steels and is suited for severe service on steam, water, oil, or gas lines, particularly when corrosion resistance is essential, as in oil refinery service. Since heat treatment after welding is necessary it is best adapted to products having flanged or threaded ends. Piping materials made of this alloy should be fabricated into units at the manufacturing shops and then shipped to job sites to

eliminate stress relieving in the field.

Carbon Forged Steel: Used for all types of steel flanges, flange unions, yokes, socket welding fittings, and valves. The forgings have a high mechanically refined grain structure and generally such excellent physical properties that heat treating is confined to flanges in the 400 psig and higher steel pressure classes. It is highly recommended for its good welding properties.

Carbon Molybdenum Alloy Forged Steel: This material has excellent resistance to creep, high strength retention at elevated temperatures, and good welding properties. Its mechanically refined grain structure is further refined by a careful heat treatment consisting of normalizing and drawing.

Chrome Molybdenum Alloy Forged Steel: This material offers unusually high retention of strength on elevated temperature service, superior corrosion resistance, and excellent resistance to erosion and scaling. The forgings must be heat treated by normalizing and drawing.

The above mentioned alloy metals are used by some of the various manufacturers of valves and fittings. The quality of valves and fittings is assured when they are manufactured under the specifications of the "Manufacturers Standardization Society," the "American Society for Testing Materials," the "American Society of Mechanical Engineers," and the "American Standards Association."

However, there are hundreds of other manufacturers that produce a product that does not meet the material quality and accuracy of machining as specified by the associations and societies. The manufacturers that do not meet these specifications are usually producers of piping products in sizes of 2 in. and under. Some of these short line manufacturers produce a product without a trademark or identification on the valve or fitting to readily identify the manufacturer.

Piping maintenance expenditures will usually be lower and the piping system more efficient when quality products are used. As most piping is in inaccessible places, such as underground trenches, tunnels, under ceilings, and over equipment, where extreme hot or cold conditions exist, piping maintenance is generally difficult to perform. Therefore, quality products that will be low in maintenance are recommended.

4. Compare Costs, Advantages of Welded and Threaded Piping

IN THE PAST, welded piping was associated with the large high pressure plants. The plant and maintenance engineers in the smaller plants assumed that a welded job was more expensive than the same line would be when screwed and flanged. It is well known that the subject of fabrication costs for piping is very controversial because of the lack of accurate comparative data.

The application of welding to the design of piping systems has provided the plant and maintenance engineer with a means of eliminating many of the difficulties he has met with in other methods of joining pipe and, at the same time, simplifying his layouts. Naturally, welded piping design should not be applied indiscriminately. Yet there is abundant proof that such design when properly applied has notable advantages, especially for systems where severe service, maintenance costs, repair facilities, and safety requirements are factors of primary consideration. The general features of simplicity, strength, and continued tightness of welded piping are already well known and accepted.

The suitability of welded piping for industrial process piping service is indicated by its extensive use in industrial power and process plants, such as public utilities, oil refineries, chemical manufacturing, chemical processing plants, food processing plants, paper mills, etc. Welded designs find wide application in this field, which is limited only occasionally by service requirements calling for the use of piping material or type of assembly that is not readily weldable, such as the large cast iron pipes and valves used in cooling water pipe lines to condensers.

There is an increasing use of welded piping in space heating and air conditioning systems for industrial plants. This is particularly true, where parts of the system must be concealed and, therefore, are not accessible for convenient repair. An outstanding example is in radiant heating, where hot water is usually the heating medium and the heated coils are concealed under floors or embedded in walls. Welding offers practically the only assurance of a tight joint as permanent as the pipe itself with the resultant freedom from possibly extensive repairs.

Welding has wider application probably in the power plant field than in other industries. In power plant installations, welded construction is used wherever possible, including joints to valves and equipment. Thus, the possibilities of gasket failure, distortion of flange facings, and the effect of creep in the bolting materials are eliminated. As a matter of fact, many designers in this field use welded construction for all general service piping, including high pressure steam and boiler feed lines, intermediate and low pressure steam lines, condensate lines, cooling water and circulating water line, oil piping, drip piping, and instrument pipe lines. Piping for low pressure and exhaust systems is generally welded. Oil pipe lines are generally made of welded steel.

There is little difference between the labor costs of welded and threaded installations. On one job, for example, the job specifications were that half of the pipe lines of 1 in. and larger should be welded and flanged and the remaining half screwed and flanged. Fifty-two manhours were required for cuts and threads on the screwed installation and 55 manhours for cuts and welds on the welded installation. Each installation required 80 mandays.

The greatest single factor in

welded installations is the elimination of leaks in the piping system. There is always the possibility of leakage in threaded installations that will average approximately 10 to 15 percent of the total labor cost of the piping job. This additional labor cost is always required to repair the leaks, according to my survey.

The average additional cost of insulation in a screwed and flanged installation is usually from 20 to 60 percent, depending on the number of flanged connections and the number of flanged valves.

An allowance for the additional cost of repairing leaks and the additional cost of insulation must be included in all estimates when estimating a piping installation of screwed and flanged construction. This very important factor is generally overlooked when estimating piping jobs. The managements of most industrial plants, I have found, do not receive this information. Any additional cost to a job is usually added at a later date to another piping maintenance account.

The cost of a flanged elbow assembly of comparable strength is considerably greater than a pipe bend and welding elbow.

The 45 deg miter welded elbow is not recommended, except in emergency installations, as flow conditions in these segmental assemblies are very poor and the difficulty of welding usually leads to uneven contours and icicles on the inside of the weld. The cost of such a connection, if made with two welds, is higher than that of the pipe bend and the 90 deg elbow.

In a 90 deg connection made with a flanged elbow, almost absolute rigidity exists in the fitting, subjecting the flange and the adjacent pipe to high stress concentration. This, combined with the inability of the bolted joint to withstand torsional forces, causes numerous gasket failures and leaks.

When installation space permits, pipe bends should be used in place of either welded or flanged elbows, as flow conditions are obviously better. The fitting assembly, however, has advantages from the standpoint of space economy, and since the fittings are usually carried in local stocks, there is the additional advantage of immediate availability. In practical applications, piping often includes a combination of pipe bends and elbows, each used where its application best serves the purpose.

Recently, forged welding socket fittings have become increasingly important for use in industrial and utility plants. There are many definite advantages to this type of construction. Although the initial cost is higher than with screwed or flanged fittings, the lower cost of maintenance due to the elimination of leaking gaskets and threaded connections amortizes the cost over a period of years. Welded construction not only simplifies the installing and insulation but also cuts down on the weight by the elimination of flanges and bolts. Changes and additions to piping may be made by cutting into an existing header and welding shaped nipples, or saddles, into the line. A line may be of all welded construction, or flanges may be installed at suitable intervals, to facilitate erection.

Welding end valves are used for the comparatively recent practice of welding valves into a pipe line to eliminate all possibility of leakage due to faulty installation. They are available in both cast and forged steel with ends specially machined and beveled for butt welding into pipe lines. For smaller sizes there are also available forged steel valves with ends bored to fit the outside diameter of pipe for socket welding to pipe lines.

The operating requirements influencing the design of a piping system include convenience, accessibility for repairs, and low cost of maintenance. All of these can be adequately provided for in welded piping design. As a matter of convenience, for example, welded piping design permits the location of control and regulating valves at almost any desired point in the system without regard to the dimensional limitations imposed by flanged or screwed construction. If the design calls for flanged or screwed end valves this convenience of location can be accomplished without an increase in the number of flanged or screwed joints in the line. The closer spacing of lines that is possible with welded construction allows a space saving in the grouping of regulating valves and bypass assemblies, instrument piping, small drip and drain lines, and connections to equipment.

The assurance of tight joints offered by welded piping design frequently minimizes the importance of making provision for accessibility. Repairs to welded lines, if such are required, can be localized to the defective part and it is seldom necessary to dismantle any other parts of the line. This feature of being able to localize the work on welded lines is of a distinct advantage when it becomes necessary to make alterations in the line or to add new branch connections after installation.

The cost of maintenance and repair must not be ignored in an effort to obtain a cheap installation. The author has seen some industrial plants where entire systems of flanged and screwed construction have had to be replaced because of the high cost of keeping the connections tight and maintaining the system in dependable working condition. Tightness and strength of connections are the primary features, and the low cost of maintenance is one of the principle advantages of welded piping design. Other advantages are: the reduced cost of piping hangers and supports, neat appearance, freedom from shutdown, no delays in placing sections of new piping into service, no damage to insulation from leaks, and the strength of the weld permits the connection to last as long as the pipe itself. Considering the increasing cost of labor to install and maintain piping equipment in industrial plants, it is more economical to install welded pipe, valves, and fittings on all sizes of piping 1 in. and larger.

Other articles by the author on piping maintenance will be published in future issues of HPAC.

40 YEARS OLD, Michigan Boulevard building in Chicago is getting 600 ton central type air conditioning system as part of $2 million modernization program

Air Conditioning Is Vital Rental Necessity Now

. . . say building owners and managers at recent conference. Merits of the central type of system, packaged unit plan, and window unit program, as examined by featured speakers, are presented here. Also given are criteria for selecting an adequate system for any particular building.

1. Central System Is Answer for 21 Story Medical Building

THE MICHIGAN BOULEVARD building, at 30 N. Michigan Ave., Chicago, is a 21 story, Class A office building, with a total rentable area of about 195,000 sq ft. It is 95 percent occupied by medical, dental, and allied tenants above the third floor. Although the building is 40 years old, it has been well maintained and commands top market rentals for medical buildings in Chicago, housing many leading practitioners.

To insure this favorable position in the future, a $2 million modernization program is now nearing completion. This includes a 600 ton, double duct air conditioning system that provides individual room control of year 'round comfort. Plans for the system were revised several times, each step providing increased refinements of comfort and control to satisfy the exacting requirements of 90 percent of the tenants, who were willing to pay the extra charge.

"In medical buildings, there is no compromise between the most highly developed system and one that does a fair job," says Murray E. Randell, Sr., of Hooker and Randell, managers of this and other buildings. Speaking before the north central regional conference of the Building Owners and Managers Association recently, he said, "Each tenant wants individual suite controls and is unwilling to submit to floor controls by the building. Doctors are dealing with ill patients, and temperature is a very important factor to them."

Partly Conditioned By Packaged Units

Before the installation of the present system, the building had experienced partial air conditioning of a more limited type. During the past five years there were installed 100 tons of 3 to 5 ton packaged air conditioning units for 60 tenants occupying about 25,000 sq ft of rentable area. (Building tenants average about 400 sq ft each.) "These were conventional duct systems which have given satisfactory service. The average charge was $700 per ton complete. The tenants paid the entire cost, including rental for the space the unit occupies in each suite," Mr. Randell said. A flat charge is made for condenser water, which wastes into the sewer. The electricity consumed by the unit is measured by the tenant's meter. Any service required, such as filter replacements and repairs, is charged for as used.

This arrangement, which the building owner found

ideal as it required no investment, was doomed a year ago when the city announced it would be forced to impose restrictions to reduce the enormous demand for water in the peak summer months, caused by air conditioning. Also involved was the equally serious problem of inadequate sewer capacities to carry the waste condenser water. Except for this warning, the building probably would have continued with the plan described, he said.

As the number of installations increased, the volume of condenser water also increased, and many of building's waste lines were overtaxed with excess condenser water. "The obvious solution seemed to be to recirculate the condenser water, to and from the units to and from a cooling tower, he said. "But the consulting engineers explained the complications of a piping and cooling tower installation adequate to serve the units and the eventual load demand, and pointed out that such a system would be unable to compete with a central plant system requiring no immediate investment by tenants. Also, the building would end up with innumerable 3 to 5 ton packaged units, which cannot be given more than a 10 yr useful life. Reluctantly the packaged unit scheme was abandoned for a central plant system."

Hold Loss of Rentable Area to Minimum

One of the prime considerations was minimum loss of rentable area to equipment rooms on each floor. Without air conditioning the rental rates in this building range from $5.50 to $6.50 per sq ft.

The total rentable area lost to air conditioning in the whole building is less than 200 sq ft. By taking full advantage of the 11 ft ceilings for 15 floors, all distribution equipment is installed in the corridor ceilings, except on the top four floors, which have 9 ft, 9 in. ceilings. The city ordinance requires an 8 ft finished ceiling, which leaves only enough space for ducts above the suspended ceiling on these floors. The distribution equipment is compactly placed in small areas on each of the upper four floors.

It was decided that air conditioning would not be forced on the tenants at once, but would remain optional for several years, so that the skeptics, or those definitely opposed to it, would not terminate their tenancies because of it. This decision gained its objective, to retain those in opposition, but created new difficulties, Mr. Randell said. "One or two tenants on a floor want air conditioning; the rest do not at the present time. Although each floor will be divided in half, with two sets of conditioning equipment, a 30 percent load is necessary to operate the equipment."

To satisfy these isolated tenants, a minority, temporary window air conditioners were provided at a charge of $20 per month each. The central system will be in operation next summer, and the window units will be removed. Making air conditioning optional increased the overall cost of the job, but the management thinks it is well worth it.

Install One 600 Ton Compressor

The initial plan was to condition the equivalent of one-half of the building now and the other half within 5 yr. The 600 ton total load required would be sufficient to serve eventually the 25,000 sq ft now being conditioned by packaged units — which will be discontinued in 5 yr or less — plus the 140,000 sq ft above the second floor now not air conditioned.

Instead of installing one 300 ton unit now and another 300 ton unit when needed, a 600 ton unit was decided on, at a saving of $36,000. Also, by buying all of the cooling coil units and blowers for the entire job at once, an additional saving of $5000 was made.

A number of technical problems were encountered during the installation of the system, according to William G. Rynes, engineer in charge of operating and construction for Hooker and Randell.

The cooling medium is chilled water, which is cooled by the 600 ton centrifugal compressor on the 21st floor. The heating medium is hot water, which is heated by a steam heat exchanger in the basement. The hot and cold water is pumped through two separate piping systems to separate coils in the ductwork.

An axial flow fan above the corridor ceiling takes a mixture of return air and outside air and pulls it through filters. This air is then forced into two separate supply ducts. In one duct is the cooling coil, and in the other is the heating coil. During the seasons between heating and cooling both heating and cooling may be operated at the same time, if needed. Two such fan systems are on each floor.

Thermostatically controlled mixing dampers for each suite, or parts of a suite, automatically mix hot and cold air from each duct to maintain the desired temperatures. These themostats are controlled by the tenants, permitting the temperature best suited to his individual needs.

Return air from each suite leaves through ceiling return air intakes and travels back to the fan through the space above the corridor ceiling.

The corridors and certain portions of tenants' spaces have suspended ceilings to cover ducts and other equipment. Primarily these ceilings in the tenants' spaces would be in rooms adjoining the public corridor. All corridor panels allow access at any time.

In the installation of the system, many problems were met and solved.

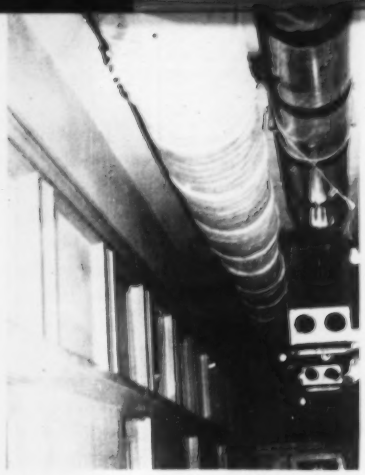
Mr. Rynes said the total electrical load requirements for a new service were approximately 1200 hp. Originally planned was a 208 volt, 300 amp bus duct, to be run from the basement to the top floor, served by a 4000 amp breaker. The cost of this bus duct, breaker, and accessories was "staggering." To reduce the cost by approximately 30 percent, the existing 208 volt system is being stepped up to a 480 volt system through the building's own step-up transformers, he said.

Because of the low ceiling corridors of the six upper floors, a fan room was installed on a section of an offset

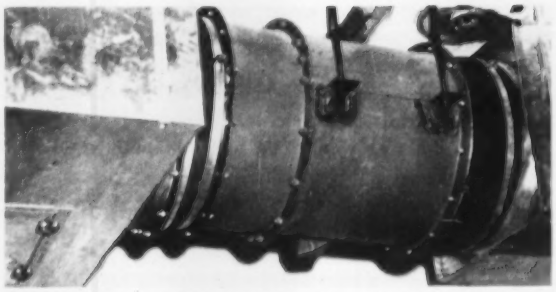
TABLE 1 — ESTIMATED OPERATING COST of 600 ton central air conditioning system for Michigan Boulevard building, Chicago, will be reduced from initial $0.215 per sq ft per yr to $0.185 when the entire building is air conditioned

	Charges	Annual Cost
Water	450,000 gal per month ($0.11 x 450 x 5 months)	$ 250
Filters	216 filters x 12 changes (2600 at $1.00)	2600
Maintenance labor	One man full time	5000
Replacement parts	$100 per month	1200
Electrical power	Summer operation:	
	Demand 845 kw x $1.40 x 5 months	5900
	Energy 680 kw x $0.08 x 1425 hr	6600
	Winter operation:	
	Demand 176 kw x $1.40 x 7 months	1700
	Energy 176 kw x $0.08 x 2100 hr	2500
Steam	320,000 lb per month additional over present use (420 x $1.90 x 7 months)	4250
		$30,000

Cost per sq ft per yr:
For 140,000 sq ft: $0.215
For 162,000 sq ft: $0.185



DISTRIBUTION EQUIPMENT installed in the ceilings for 15 floors, held total loss of rentable area to less than 200 sq ft in the Michigan boulevard building



AXIAL FLOW FANS above corridor ceilings draw a mixture of return air and outside air through filters, then force the air into two separate supply ducts. One duct contains a cooling coil and the other one a heating coil. Two such systems are on each floor

roof, thereby eliminating the use of rentable areas on those floors.

Stopping or starting all pumps or fans on any floor is controlled from the machine room. Also in the machine room, temperatures from predetermined areas throughout the building may be measured.

Filter gages will show when a filter change is necessary. Flow meters will show the amount of chilled water and condenser water being pumped through the system. A pneumatic tank was installed to boost the water pressure sufficiently to allow the makeup water to be supplied to the cooling tower.

Another problem, said Mr. Rynes, was hoisting the compressor, which weighs 58,000 lb, over the roof, then lowering it to a subroof. There a section of the outside wall of the machine room was removed to admit the compressor. The 58,000 lb compressor rests on isolation pads to eliminate any vibration.

The piping for this unit was also a problem. A stairwell in the east half of the building permitted the installation of five runs of 1½ to 6 in. diam pipe from the third to the 21st floors. Also, in an old abandoned coal bin ventilating stack in the west end of the building, five runs of 1½ to 6 in. diam pipe are installed. The stack also provides outdoor air for certain floors.

Estimated operating costs are given in Table 1.

The consulting engineers are Cary B. Gamble and Associates of New Orleans.

2. How Packaged Units Compete with a Central System

ALTHOUGH in the midst of installing a central air conditioning system in the Chicago Board of Trade building, Richard M. Walrath, vice president of Hogan and Farwell, Inc., Chicago building management firm, took up the case for packaged units. He said his firm has been operating one unit winter and summer for 16½ yr and it is doing a good job. "Furthermore," he said, "now operating in various offices of the Board of Trade building are packaged units of nearly 400 tons capacity. Also, I have been surveying another building from an air conditioning standpoint, and am recommending packaged units for this job."

In his opinion, a packaged air conditioning unit has the following advantages:

1) It has a direct expansion coil in the air stream for cooling and dehumidifying, together with a steam coil for winter use.

2) It usually has all controls built in, and qualified personnel are not required for operation.

3) It usually arrives enclosed in a housing with appropriate access panels and duct connections.

4) It is quiet and efficient in operation.

Recently he surveyed a building with the following characteristics: It is 19 stories high. Ceilings are 10 ft, 9 in. Rental area per floor is 4200 sq ft. Exposures are east, south, and west. Exterior dimensions are 51.14 × 110 ft. Occupancy is medium grade tenants, some of which might not pay for air conditioning. Corridor

modernization is required. Depth from windows to corridor is 32 ft.

The first plan involved a central chilled water system with ductwork and a ceiling mounted air handling unit on each floor. The latter would save 36 sq ft in each case. A central system without air handling units was bid at $150,000 for 250 tons. Air handling units and ductwork for the 19 floors — which could be installed one floor at a time — would approximate $6500 per floor, or $123,500.

"We were not worried about the cost of the air handling units," he said, "as we could do that work one floor at a time, and upon completion of each we would expect approximately $3150 per floor additional income at 75c per sq ft. The outlay of $150,000 is what bothered us," Mr. Walrath said.

Next they got a price on a tower with piping for 19 floors which would serve as a condenser supply for packaged units on each floor. This bid, including connections, was approximately $45,000.

Then they considered air cooled units, ceiling hung. The bid was for two 5 ton units per floor, one on the east side and one on the west side. This, of course, was the best arrangement at $8500 per floor. However, it produced insufficient capacity to do the desired job. To increase the number of units to three seemed impractical, he said.

The fourth study involved a 15 ton packaged unit combined with an evaporative condenser. The compressor unloads to three stages with 6 cylinders: 67 percent of capacity, 50 percent, and 33 percent. The rated capacity of the fan is 6000 cfm.

"We are confident that this installation will do the job at a cost of $12,000 per floor, plus the cost of the steam riser which was estimated at $1000," he said.

The total costs of the two systems are estimated to be:

Central system	$273,500
Packaged system	232,000

"The big difference is that we can cross our bridges as we come to them. For example, we have a vacant floor at present which can be air conditioned for the cost of one unit, plus the cost of a steam riser, or $16,000. To air condition this first floor with a central system would cost $156,500."

3. Window Units Offer Expedient Solution

Progress with window unit air conditioners was emphasized by Ross J. Beatty, Jr., manager of the estate of Leander J. McCormick, Chicago. "I think the old fashioned window box that projects through the window and results in difficulty in window washing and air leakage in the winter is on its way out," he said. "The units that I think require another look are the units that can be installed within the window and which permit the easy opening and closing of the window behind them."

He described one such unit that hangs on the window sill, with the greatest area of working parts below the window against the wall. Only the air intake and exhaust are above the sill, and the window can be closed outside of the unit. This design incorporates a heating coil in the unit which can be connected to either hot water or steam lines. The heating coil is a standard coil and similar to the coils used in other heating systems.

"The window unit takes advantage of the outdoor air immediately adjacent for the air supply instead of having this air moved from a central intake point through large ducts in the building," he said. "The air introduced through the unit is filtered, chilled in the summer, and heated in the winter. Of course the unit has a thermostat which will regulate the temperature during summer and winter."

In the Roanoke building, 11 S. LaSalle St., Chicago, window units installed on two floors for one tenant completely air condition the space, assisted only by a supplemental package installation for the central area. "We kept records of the dry and wet bulb temperatures and recorded the average dry bulb temperature per day and the relative humidity," he said. These readings were taken at a number of places throughout the tenant's space, twice a day in the morning and afternoon.

	Area			
	Lobby, not air conditioned		Tenant space, two floors, air conditioned	
Date, 1955	Temperature, F	Relative humidity, percent	Temperature, F	Relative humidity, percent
August 27	81	51	70	55
28	85	55	75	51
30	81	65	75	50
31	81	50	75	50

Conditions in the tenant space averaged 71 F DB and 51 percent RH.

The exact cost per unit for the installation in the Roanoke building was $130, he said, including a 5 yr guarantee, permit, and the cost of bringing special electrical wiring to the unit. "We arrived at a cost of $120 per yr per machine to amortize in a 6 yr period and provide electricity and service. Since each machine conditions 300 sq ft, the capital cost is $1.40 per sq ft.

"We installed one of the units through the wall. We estimated that on a fairly large scale the cost per hole would be about $52, to which should be added a sum for patching, etc. We roughly estimated a total cost per installation of $60, which would raise the capital cost 20c per sq ft. Incidentally, this unit is practically enclosed within the wall. Because of this, nearly all of the noise is absorbed.

"The use of these units provides time in which to turn around and decide exactly what air conditioning policy to adopt for any particular building. In some cases, the immediate installation of the very best central air conditioning system is absolutely sound. In others, it's wise to stop, look, listen to consider all of the factors before deciding."

1 ELECTRIC HEATER-VENTILATOR UNITS under windows are supplemented by electric heating cable in floor of kindergarten room at Parkside school, Hartford City, Ind.

Heat Schools ELECTRICALLY?

Here's how costs were figured and why electricity was chosen for the Parkside school in Hartford City, Ind. This article also presents a report of the first year's operation of this school heating system.

BY ROBERT LEE BOYD

Development Engineer
Electromode Div.
Commercial Controls Corp.

LAST YEAR an unusual school opened in Hartford City, Ind. The distinguishing feature of the Parkside school is its heating system, the first in the midwest, to our knowledge, with an all electric heating system. (See the December 1955 HPAC for an earlier article about this school.)

The school had to be built with expansion planned as funds became available. To the original group of eight elementary rooms, one kindergarten room, and administrative spaces (general office, principal's office, health room, and teachers' room), there are now being added four elementary rooms, kitchen, and a multipurpose room.

This article reviews the operating costs and experience record of this installation.

The elements of construction with their heat loss factors are listed below:

Glass block	0.56	*U* factor
Window glass	1.13	*U* factor
Wall	0.14	*U* factor
Ceiling	0.056	*U* factor
Slab perimeter	55.0	Btu per linear ft.

The total heat loss at an 80 F differential was calculated to be 747,900 Btu per hr, including infiltration.

Using the information in the American Society of Heating and Air-Conditioning Engineers "Guide" for 1956, calculating the oil consumption for a building with this heat loss, and based on 5600 deg days and a seasonal efficiency of 70 percent, we find a calculated oil consumption of 16,015 gal. Since there are 141,000 Btu per gal of oil, at 70 percent efficiency the total heat to be delivered

during the season amounts to 1,580,680,500 Btu. There being 3413 Btu in a kwhr of electricity, 463,135 kwhr is the expected requirement to heat this school.

The cost of heating the school on these two bases is indicated as follows: (a) At 10c per gal for oil, $1601.50 per year of 5600 deg days. (b) At 2c per kwhr for electricity, $9262.70 per yr of 5600 deg days.

This is nearly six times as much to heat with electricity as with oil at current typical costs. Why, in the face of such arguments, did this board consider electric heat? They recognized the fact that electricity as a fuel offers opportunity for control of the heat so that such a method of cost comparison does not present the complete picture. Let us see their reasoning.

Clock Controls Operating Cycle

The contemplated cycle of operation was to maintain a temperature of 70 F from 6:30 a.m. to 4:00 p.m. five days per week, starting early to allow time to bring the temperature up to normal at the scheduled opening of classes. Aside from these times, the building was to be held at a night setback temperature 20 F lower than the daytime setting. Ventilation air was to be furnished only during the 6½ school hr per day, from 8:30 a.m. to noon, and from 1:00 p.m. to 4:00 p.m. This accurate control of schedule of operation was possible because of the use of specially designed heaters which require no fan operation for heating in the night cycle, have no dampers to be operated or to leak, and ventilation air is furnished only when called for by clock controlled, positive operation of the fan motor. At all other times, only normal infiltration is experienced.

On this basis, the estimated heating cost prepared by T. A. McConnaughey, the architect, George Ravaux, the consulting engineer, and the representative of the serving utility was between $2000 and $2450 per year. The heating cost for oil with night setback was not calculated, but some saving would also be realized, depending upon the system and building heat storage characteristics.

Simple Method to Figure Costs Developed

The writer has developed a simple method of calculating operating costs for schools heated in this manner, which is detailed below for this particular building.

Heat loss of building is 116 kw, or 34.8 kwhr per deg day. Infiltration plus ventilation load in daytime is 85 kw, or 25.5 kwhr per deg day. Infiltration load, without ventilation, is 68 kw or 20.4 kwhr per deg day. To the base 65 there are 5600 deg day. To the base 45 there are 1760 deg day. Daytime temperature setting is used 28.3 percent of the time (9½ hr, 5 days per wk). Night setting is used 71.7 percent of the time (balance of the week). Ventilation and infiltration are experienced 19.3 percent of the time (6½ hr, 5 days per wk). Infiltration alone is experienced 80.7 percent of the time (balance of the week).

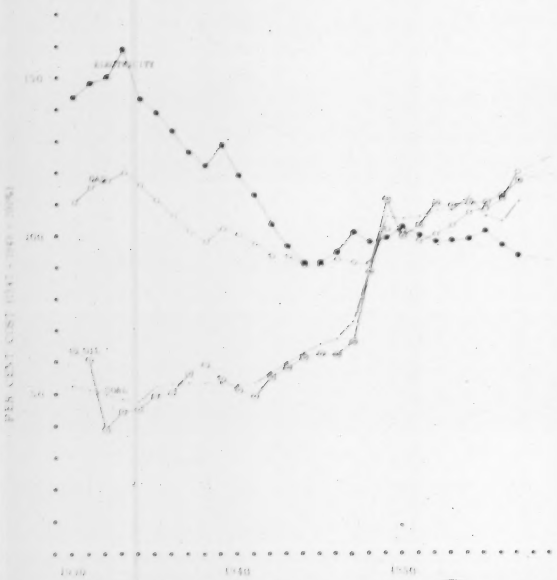
Heat loss of building excludes ventilation or infiltration load. The sum of the building heat loss plus infiltration and ventilation is less than the design heat loss quoted previously because the detailed losses are calculated on a room by room basis with ventilation experienced only in warmer daytime hours. We find:

Daytime load is 34.8 × 5600 × 0.283, or 55,151 kwhr per yr.

Night load is 34.8 × 1760 × 0.717, or 43,915 kwhr per yr.

2 ELECTRIC COIL is exposed in unit heater-ventilator being installed here. Four units are in each classroom. Ventilation is automatically controlled by time clock

3 CONTROL PANEL and electric substation for school's electric heating system are housed in utility room that would have been the boiler room for conventional system



4 CHANGING FUEL COSTS are compared here for electricity, gas, oil, and coal. Fossil fuels have cost more since World War II; electricity, less. This data is from the Office of Business Economics, U. S. Dept. of Commerce

Ventilation load is 25.5 × 5600 × 0.193, or 27,560 kwhr per yr.

Infiltration load is 20.4 × 1760 × 0.807, or 28,975 kwhr per yr.

This gives a total of 155,601 kwhr per yr to heat an empty, dark building. However, certain credits are in order. Assuming 180 people at 150 Btu per hr per person, sensible heat emission — for school children, versus 195 for adults — this is equivalent to 7.9 kw of heat, plus 16 kw for lights, giving a total of 23.9 kw of internal heating. Since this cannot be considered a credit unless we need heat, we consider this applies only during the 21.5 weeks of November through March. In other months, we consider that the credit on cold days will be offset by additional energy to heat extra ventilation air on warm days. Therefore, the credit becomes 23.9 kw × 6½ hr × 5 days × 21.5 weeks, or 16,700 kwhr per yr.

Vacation credits were considered by analyzing two weeks in December, and we found that only 804 kwhr less were required to maintain the building at 50 F than to heat it five days a week and take credit for lights and people heat. Thus, the total credits applicable become 17,504 kwhr, making our net energy requirement for heating 138,097 kwhr per yr. This would cost, at 2c per kwhr, $2761.94 per yr. Being higher, this is evidently a more conservative figure than was used in the Hartford City estimate, but is certainly within the general range of it. While it is acknowledged to be somewhat short of a precise method of figuring, most inaccuracies are in the nature of increasing the estimated cost, and it is felt best to continue with such a conservative view until a more rational method has been developed and checked with field results over a few years' operation.

While this method of calculation yields satisfactory accuracy in high degree day areas, it is expected that, in common with other degree day methods of calculation, it will not be accurate for low degree day areas. Under such climatic conditions, a temperature analysis taking into account the number of hours various temperatures are experienced, or the "degree hours," must be used for satisfactory accuracy. As experience records are gained in each area, local empirical formulas can be developed.

First Year Costs Analyzed

How does the calculation conform to what experience shows must be paid for the services calculated. At this school, the total cost of electricity for October through May was $3276. Submetering of the electric heat circuits showed that of this total $2669.60 was used in the electric heaters. While a little above the estimate the board had used, this was within reason for the abnormally cold winter in the school year 1955-1956.

But there were other factors that threw this cost higher than might normally be the case. These include:

1) The temperature was maintained at 74 F instead of the 70 F calculated. This would be expected to account for about 13.2 percent higher cost.

2) From September through December, the controls were improperly adjusted to the job, and the ventilation operated 24 hr a day, seven days a week. This would be expected to account for about 6 percent higher cost, or 14 percent if continued throughout the school year.

3) The offices, teachers' room, and equipment room are not controlled to night setback temperatures. The amount of extra heat required for this is not subject to reasonable evaluation.

4) The operating schedule was set up to turn the units from night setting to day setting at 4:00 a.m. and back at 4:00 p.m. for the convenience of early arrival and late departure of teachers. This requires a day setting of 12 hr instead of the 9½ hr contemplated. This would account for about 7.2 percent higher operating cost.

5) The winter was colder than normal, with an estimated 8 percent more degree days.

6) From December 31 to March 19, the controls were still slightly out of order, resulting in outside air being furnished for ventilation 12 hr a day, five days a week, instead of the 6½ hr per day originally figured. This may account for about 1 percent higher cost.

The total of the factors leading to higher costs indicates a cost for the first and only season yet experienced about 35.4 percent higher than normal, or justifying a cost of $2708 to $3317 per yr for these abnormal operations. The actual cost of $2669.60 falls below these limits.

Calculate Economies of Electric Heating

Those who have not worked with electric heat may not appreciate the economies that result from the use of a fuel which is utilized directly at the point of use, and at an invariable efficiency of conversion from fuel to useful

heat of 100 percent. Even the so-called line losses, small as they are, are experienced within the building — unless the lines are run outside the building — so they are not actually losses at all, and they exist only when the heat is being used.

The practical methods of calculating fuel consumption are based on actual experience records. This is true of the widely used degree day method for conventional fuels, and over the years of experience, this data has become fairly indicative of the results to be obtained. Since we are dealing with a fuel not previously widely used in school applications, we must turn to other fields for the experience record, until such time as sufficient record has been established in this field. In the field of electric space heating for residences, the Federal Housing Administration uses a formula for estimating the operating cost of electrically heated homes based on the following: kwhr per yr = (Btu per hr heat loss × deg days)/(design temperature difference × 170).

We also know that basically in the degree day method, the following is true: kwhr per year = (Btu per hr heat loss × 24 × deg days)/(3413 × design temperature difference × efficiency).

The FHA formula indicates an *apparent* efficiency of 119.5 percent. The electric heat industry has found that a factor of 200 replacing the 170 gives more realistic results. This indicates an efficiency of 141 percent. The National Electrical Manufacturers Association in its "NEMA Manual for Electric House Heating" uses a formula indicating an efficiency of 129.7 percent and further indicates that on a number of individual installations an efficiency of as high as 199.7 percent would be indicated by the experience factor determined.

Since electrical resistance heaters are 100 percent efficient in conversion of electricity to heat, experience records indicate efficiencies apparently higher than 100 percent on account of the heat gains from occupants, lights, and sun effects.

Why Is Electric Heating Found Efficient?

The question arises, why does experience show electric heat is so much more efficient than conventional calculations would indicate? With no particular embarrassment, I can say that we just don't know. Even though no one has ever seen electricity or knows for sure just what it is, we do know enough to utilize it effectively, and to predict just what will happen under most conditions. Our experience with it is growing every day as more installations of the type in this school are made.

With an electric system, heat is applied at once when called for, and turned off positively at once when the demand for it has ceased. There are no standby losses or carryover to one room because of another room.

From considerations of a realistic approach to the use of electricity for heating then, and using units specifically designed to make the most effective use of this highly controllable medium, it is apparent that we can afford to heat a school electrically today. That statement was not true 20 years ago.

Cost of Fuels Compared

What changed this situation? Part of the answer is the increase in costs of fossil fuels in the past few years while the cost of electricity was being reduced or holding firm, as shown in Fig. 4. The chart has extension lines based on 100 percent for 1948 established by axis definition, and through the average cost for the first five months of 1956.

In spite of the increases noted in fuel costs, electricity, which comes largely from fuel fired boiler plants, has held firm, and even reduced lately. Although the unit cost of fuel has gone up, the efficiency of generation has gone up even faster. It took 3 lb of coal per kwhr in 1920; 1.6 in 1930; 1.34 in 1940; 1.19 in 1950, and less than 1 lb in 1954. So the net effect is a reduction in cost of fuel to generate electricity in spite of higher cost of a given quantity of fuel.

With the coming into use of atomic energy, whether fission or fusion, or with the coming of some other limitless source of power as yet undeveloped, the fuel cost is inconsequential, as the generating plant costs as much operated at 1 percent as at 100 percent of capacity. Under such a condition, the energy — kwhr — used is unimportant, the demand — kw or kva — and the time of use becoming all important. We are seeing the summer peak on electric utilities come steadily northward.

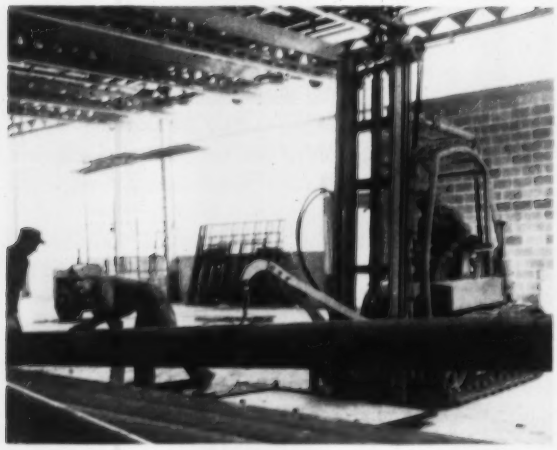
The Indiana & Michigan Electric Co., which serves Hartford City, made available September 1, 1956, a special flat rate for electrically heated public schools of 1.6 cents per kwhr. All of which indicates that if it is at all practical to heat electrically today — and it is — each successive year will find it more practical.

School Construction Savings Can Be Achieved

In a school designed for electric heating, savings can be made in first cost over the cost of conventional systems, and the savings will contribute materially to paying the heating bill. By building the school on a well insulated slab, eliminating crawl spaces and trenches for servicing pipes; by insulating the roof and walls better; by reducing glass areas to more reasonable values, and by holding the operable windows to a minimum required for safe exit in case of emergency, we can effect substantial savings in construction costs.

Also, savings may be effected in insurance rates and in attendance, maintenance, and housekeeping labor because of the automatic and clean heat provided by electricity. And future expansion of electrically heated schools is simplified. ≠

Using two forklift tractors as mobile elevators and lifting cranes, piping contractor . . .



MOBILITY is an important forklift tractor advantage. Hook cable of hydraulic crane is placed around pipe so it can be carried and raised into position

Speeds Piping Jobs, Saves Up to

BY ROBERT W. LAWINGER

President
G. J. Reynolds Co.

Two crawler mounted forklifts, used as mobile elevators and pipe lifting cranes, have resulted in saving us as much as $300 to $1000 per month during the past year. Each machine does the work of about eight men.

Equipment for each unit includes a 14 ft. 3 in. mast plus extension for lifting to a height of 21 ft. 4 in.; steel material handling forks; a hydraulically operated crane hook developed especially for us; and rubber track pads which enable the tractor to travel on interior floors as well as over rough or muddy ground. We built our own 5 × 8 ft work platforms, with iron safety railings, which can be quickly clamped onto the forks of each rig.

Elevates Pipe Fitters and Pipe Sections

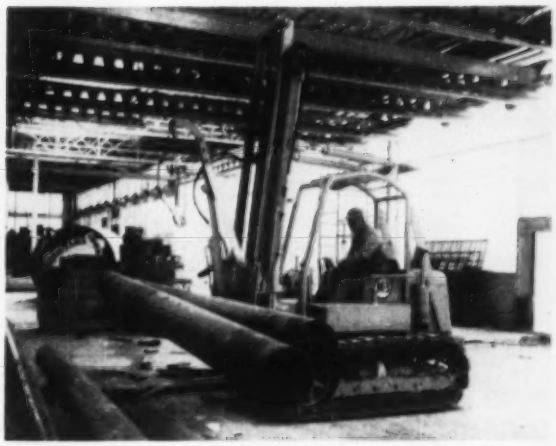
The accompanying photos were taken in Waukegan, Ill., where one of the units was installing some 265 tons of overhead water, gas, and heating pipes, ranging from 3 in. to 16 in. in diameter, in a large addition to the Johnson Outboard Motor Co. aluminum foundry. The second machine was in Galesburg, Ill., working on another Johnson plant at the time.

Speed and convenience are features Bill McClure, superintendent on the Waukegan job, likes most about the forklift. Using it to elevate both men and materials reduces, and in some cases completely eliminates, the need for erecting scaffolds and rigging chain hoists to lift pipe. The men like it because they are raised into position instead of having to climb. This was particularly beneficial during the past summer, when the ceiling got so hot that welders could work only short periods.

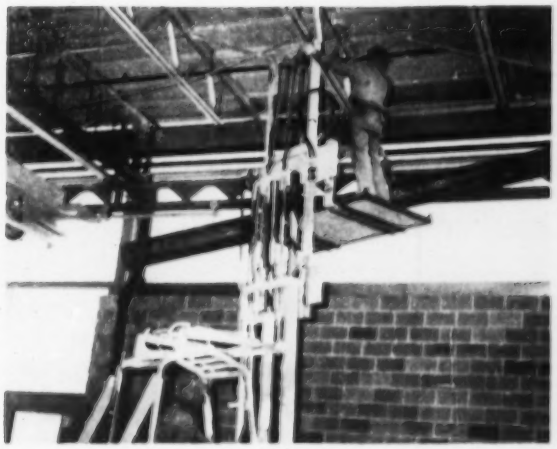
On a typical piping installation, the machine first carries pipe and fittings from the stockpile to the spot where they are to be used. If there are no overhead obstructions, from two to four 21 ft lengths of pipe are welded together on the floor. Then the lift raises one end of the assembly into place by means of a cable fastened to the crane hook. A pipe fitter rides up on the platform — from which the railings have been removed — to direct the lift operator, who swings the pipe accurately into place with his hydraulically operated crane hook. The crane raises 6 ft, giving the machine an overall lifting height of 27 ft, with a forward reach and tilt of 6½ ft.

Serves as Platform for Pipe Welders

With one end fastened, the other end of the piping assembly is raised with the crane hook. This time a welder rides up on the platform and spot welds the pipe in place, after which pipe fitters ride the lift to bolt the pipe hangers.



CARRYING PIPE and other materials from stockpile to work site is one of many labor saving jobs done by crawler mounted forklift. Here it carries two 21 ft lengths of 12 in. pipe



RAISED SECTION of 12 in. pipe is ready to be clamped in place. Because of overhead obstructions, only one section was lifted. Usually two or more are welded on floor, then hoisted

$1000 a Month

SLIPPING PIPE INTO HANGERS, man rides lift to direct operator below. Mast is raised as high as ceiling permits, but 6 ft more crane hoist gives rig a lifting height of over 27 ft

Expansion loops are also assembled and welded on the floor, and raised into place as a unit. Large pipe, up to 18 in. in diameter, is raised one length at a time.

When several sections of pipe have been hung, a welder and his helpers are raised to complete the welding. With the platform fully raised, a welder can reach about 28 ft high. Or if greater height is desired, boards are placed on top of the platform railing to raise him another 3 ft. Even at full lift height the platform is perfectly steady, the men report.

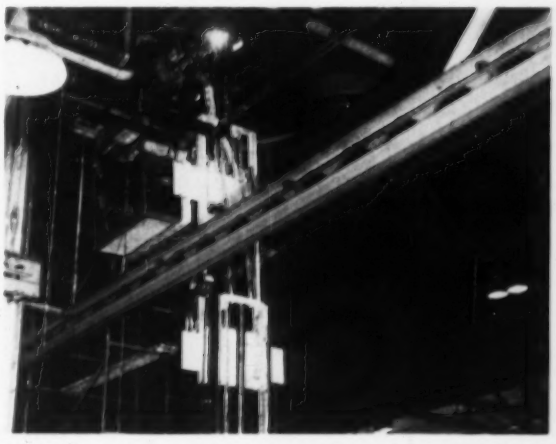
We still use scaffolds, so both welders and pipe fitters can keep working. But they all prefer the forklift.

Put Lift to Variety of Other Uses

The lift was especially handy on one job because there were so many overhead cranes, beams, and other obstructions that scaffolds could not be rolled from one spot to another, but had to be torn down and re-assembled after each move. Even here the lift helped, by moving planks and placing them on the scaffolds.

The lift saved time and labor in many other ways, too. On this job, for example, it lifted 1800 lb overhead heating units and 1700 lb transformers into place. It also pulled heavy equipment such as pumping units, air conditioning compressors, welding machines, and generally helped out with heavy lifting and moving. ✠

Photos courtesy American Tractor Corp.



WELDER joins sections of 8 in. steel pipe, using forklift as mobile platform. Work continued in foundry without interruption as unit easily maneuvered between machines

FOUR BOILERS UPSTAIRS and three downstairs meet peak load demand of 700 hp. Vent above each reduces draft of 180 ft stack

Install Seven Package Boilers To Heat 14 Industrial Buildings

. . . and supply process steam

THE AMERICAN INDUSTRIAL BUILDINGS DIV. of H. D. Koblitz, Inc., in Cleveland heats a group of 14 buildings and supplies process steam to two tenants. Total peak load is 700 hp, 450 hp for heating and 250 hp for processing.

Replace Original Equipment

Original equipment was two 300 hp water tube high pressure boilers installed in 1910. Recently the decision was made to replace the old equipment with package boilers that do not require constant attendance and which operate automatically. One prerequisite was that the changeover to the new units be made with no shutdown. This was imperative because of the continuous process load.

Seven 100 hp package steam generators of 200 psig design are installed. The boilers are cut in to the existing 180 ft stack. Each boiler has a 48 sq in. vent just above the top of the unit to reduce the draft.

Change Over Without Shutdown

The changeover was accomplished with no shutdown. A balcony was built in the winter to hold the first four boilers. The load at this time was carried by the old boilers.

In the spring, the four new boilers were mounted on the balcony and put into operation. Then the load was transferred to the new boilers.

With four new boilers in operation, the American Industrial Buildings maintenance crew utilized the summer period to rip out the old boilers and install three new 100 hp package units downstairs in their place.

One space is left to be filled with another boiler unit if the steam demand increases.

Furnish Heat and Process Steam

The 14 buildings heated by American Industrial total 325,000 sq ft. They are heated mostly by unit heaters — 125 of them. Buildings are divided into five sections, depending on the type of occupancy. Temperature in any individual zone can be controlled by conventional thermostats. For heating, the 185 psig of operating pressure is reduced to between 5 and 15 psig. In the five story building, the pressure is 15 psig; in others, it varies from 5 to 15 psig.

The heating load, of course, varies with the weather. The company operates with a 12 hr shutdown when the temperatures are above 20 F. When the temperature ranges from 10 to 20 F, they allow a 4 to 5 hr shutdown. Under 10 F, the boilers are on 24 hr a day.

Process steam is furnished upon tenant demands.

Seven gas fired, 100 hp package steam generators of 200 psig design replace two 300 hp water tube high pressure boilers installed in 1910. Continuous process load required changeover without shutdown.

The load varies, of course, depending on the number of shifts the lessees are running. The chromium plating plant uses about 50 hp, and a container manufacturing company uses about 200 hp.

Mount Controls on Central Panel

Although the package boilers are furnished with all feedwater pumps, fuel pumps, and controls mounted directly on the unit, American Industrial has removed them and mounted them at a single point.

The boilers burn natural gas. There are eight gas meters on the line. A 16 in. main pipe supplies the gas from the meters to the boilers so that if two or more boilers are required to operate at one time, there is no drop in pressure.

All feedwater pumps have been removed from the units and mounted under the balcony. All are connected to a manifold so that any boiler may be fed by any pump.

Boilers run on about 15 percent new makeup water. A deaerator boilerfeed system is utilized. The capacity is 1000 hp. A heat exchanger mounted beneath the deaerator reclaims excess steam through the boiler feedwater.

In winter, condensate is returned to the deaerator, then directly into the feed pumps. In summer, condensate comes in too hot to be released directly into the deaerator. Because it would flash into steam, it is piped to the heat exchanger before entering the deaerator. Throughout the summer, the company operates the boilers on 275 F feedwater. In winter, the feedwater temperature is about 210 F.

The boilers at American Industrial are blown down daily. Feedwater is treated daily in the return system to eliminate corrosion, pitting, and oxidation.

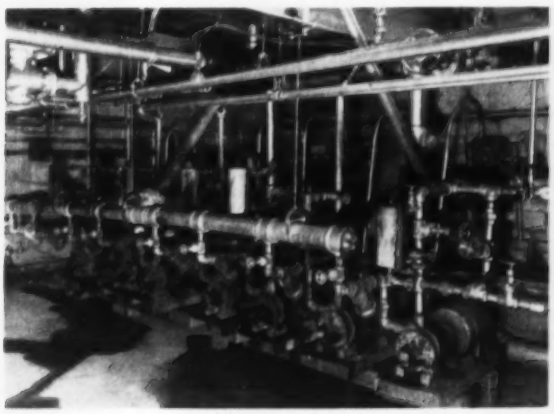
It is a standing rule that no operator touches a control on any of the boilers. The boilers are instrumented so as to turn on a light and blow a siren if there is any failure. This makes it unnecessary to keep a man in the boiler room at all times. Rather than try to adjust a boiler himself, the operator cuts in another unit on the line.

The engineer in charge of the installation makes a weekly inspection every Monday. Anything that he sees wrong during the course of this inspection is corrected by the following Saturday.

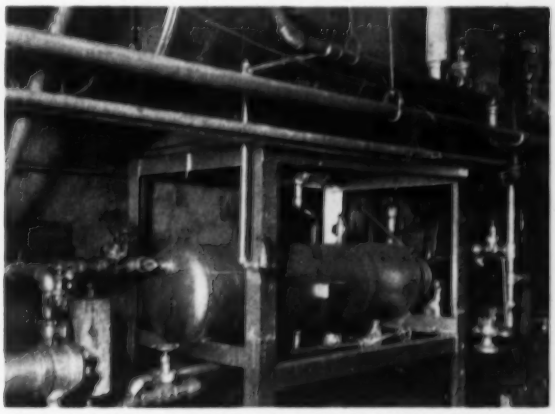
His weekly check list consists of the following:

1) Low water cut-outs.
2) Pump relays.
3) Flame color.
4) Test alarm system.
5) Tightness of rear doors. Go over each lug with a hammer.
6) Gas pressure on each boiler.
7) Feedwater temperatures (checked daily, too).
8) Stack temperatures (breeching outlet temperatures).
9) Meter readings are made daily at 8:00 a.m. These are checked against the number of hours process steam was required and the mean outdoor temperature for the past 24 hrs. This is also checked against degree days.
10) Leaks in feedwater lines, hand holes, etc.
11) Check blow-off valves.
12) Safety valves.

Photos courtesy Cyclotherm Div., National-U.S. Radiator Corp.



PUMP AND VALVE SET-UP allows any one feedwater pump to serve any two boilers if necessary. Pumps are connected by manifold and are centrally mounted under balcony



DEAERATING AND HEAT RECLAIM SYSTEM supplies boiler feedwater at 275 F in summer and 210 F in winter. Feedwater is treated daily to eliminate corrosion pitting

Well Water Corrosion Eats Hole in Piping Budget

. . . as result of improper selection of materials for system serving air conditioning installation

BY JOHN F. HOFFMAN
Civil Engineer

Corrosion costs due to aggressive waters annually total many millions of dollars. These dollars represent a two fold waste: one of material rendered unfit for service, the other of inconvenience and financial loss resulting from equipment shutdown. The costs involved when using an unsuitable piping material with an aggressive well water are shown in the following analysis.

Well water supplying an air conditioning installation in a building in Nassau county, Long Island, N. Y., is pumped from shallow water bearing sands at a rate of 69 gpm. Its degree of corrosivity was disputed during the design period. The well driller's chemist said the pH was 5.4, while a general analytical laboratory said it was 6.6. Later, a water analytical laboratory determined a pH of 5.8.

Despite the discrepancy, pipe was specified for the well water system on the basis of the pH of 6.6. If a pH of 5.4 had been accepted, more expensive corrosion resistant pipe would have been specified.

17 Leaks in Five Years

During the first five years of operation, because of the corrosivity of the water, more than 17 leaks in the piping developed. Replacement of the leaky sections did not constitute a satisfactory solution because the leaks continued to occur. Still a problem at the present time, the corrosivity — affecting piping, valves, and pump parts — is thought to be sufficiently critical that replacement of the existing piping with a more corrosion resistant material is being considered.

The types of trouble arising from corrosion and the frequencies of occurrence are shown in Table 1.

The repairs and maintenance indicated in Table 1 are in addition to the normal 4 hr weekly maintenance procedure scheduled for each air conditioning system. Such routine maintenance during the six month air conditioning season requires about 13 man days and represents an annual labor cost of about $330. A mechanic's wage weighted for supervisory costs and other factors is $3.20 per hr.

The annual cost breakdown of these repairs, exclusive of routine maintenance, is presented in Table 2. It is estimated that the repair of each leak required an average effort of two man days. At a labor rate of $3.20 per hr, this represents about $51 per leak. With the exception of the well contractor's work, which included both material and labor, these figures indicate labor costs only. Costs for the replacement piping, fittings, and valves are not available, and thus the figures in Table 2 are conservative.

Besides increasing the maintenance costs of the system, the effects of corrosion increased plant maintenance costs resulting from the lack of air conditioning during periods of system shutdown. Relay trouble in the electrical equipment in the air conditioned space increased during these times.

Repairs Cost $3000 in 15 Years

Repair costs through 1954, when related to the time of system installation, represent a sum of about $1330, using an interest rate of 7 percent on

TABLE 1—NATURE AND FREQUENCIES of repair of piping, valves and other parts as a result of corrosion in a well water system used for air conditioning are shown here. The pH is 5.8

	1950	1951	1952	1953	1954
Replacement of piping	NR*	2	5	8	2
Maintenance of valves, strainers, etc.	NR	2	2	1	0
Maintenance of well and well pump	NR	1	2	1	2
Other maintenance	NR	2	0	0	1

*NR — No record

TABLE 2—REPAIR COSTS for replacement and maintenance caused by well water system corrosion are shown here. Routine maintenance and material costs of piping, fittings, and valves are not included

	1950	1951	1952	1953	1954
Replacement of piping	NR*	$102	$255	$408	$102
Maintenance of valves, strainers, etc.	NR	X	X	X	X
Maintenance of well and well pump	NR	26	51	441	349
Total		$128	$306	$849	$451

*NR — No record
X — Work done under routine maintenance

borrowed capital. However, future repairs may be expected to occur as frequently as in the past; therefore, when computing the economic penalty involved, repair costs should be considered throughout the estimated 15 year life of the installation instead of the five year period of operation. This can best be done by converting the above sum of $1330 to a uniform annual repair cost for the five year period and then relating the uniform annual repair costs for 15 years to the beginning of that period. On this basis, these unanticipated repairs cost slightly more than $2950. Thus, at the time of design, at no extra overall expense, an additional $2950 could have been applied either towards the selection of more corrosive resistant materials, or towards utilizing another method for compressor cooling, eliminating well water entirely.

Regarding the selection of materials, the resulting installation must not require more than the presently required routine maintenance and it must have at least the same life expectancy as the existing system.

The inaccurate determination of corrosivity in the experience cited will have cost the company at the end of 15 years more than $8100. If the direct and indirect costs arising from the lack of air conditioning are included, the cost is much greater. The economic penalty of corrosion is sufficiently great to make worthwhile the time and expense involved to obtain the best possible appraisal of the corrosive properties of the ground water available at the site and to select the right materials for piping, valves and other parts. +

Airport Air Conditioning Breaks Record

. . . *for total cooling capacity in New York area*

THE REFRIGERATING PLANT for New York International airport's projected "Terminal City" air conditioning system will break all New York area records for total cooling output, according to the Carrier Corp. It will also be the world's largest installation of absorption refrigerating units, which use heat to produce cooling.

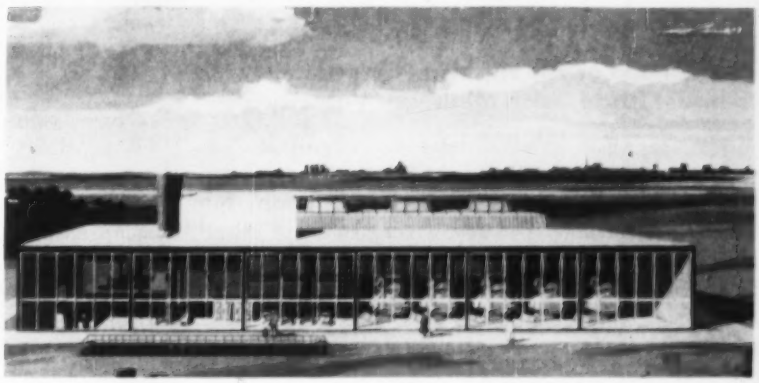
The new contract placed by The Port of New York Authority adds four absorption machines of 700 tons of cooling capacity each to the five already on order, bringing the total cooling output to 6300 tons.

The nine machine installation will provide chilled water for the complete air conditioning of the 10 unit terminal buildings to be constructed around a landscaped oval of 655 acres.

The air conditioning contract is part of a $90 million program scheduled for completion by 1965.

The cooling plant will be more than half again larger than any of the three biggest systems installed previously in the New York area: in the Socony-Mobil building, the New York Coliseum, and the United Nations headquarters.

The water chilling machine will use hot water to produce cooling. Most previous absorption machine installations have had steam as the source of heat energy.



REFRIGERATING PLANT for New York International airport's air conditioning systems consists of nine hot water absorption units totaling 6300 tons

Housed in a modern utility power house centrally located to all airline stations, chilled water will be distributed through underground pipes in much the same manner as other services.

Pipe lines will extend nearly half a mile to supply some of the structures in the oval area, which is three fourths the size of Central Park. The main chilled water mains from the central station will be 2 ft in diam.

The major building in the modern project using the chilled water supply for air conditioning is the International Arrivals building, with two adjacent airline wing buildings. Three stories tall at the highest point, it will stretch for a distance of 11 city blocks.

At New York International airport, high temperature, high pressure hot water will be employed to boil excess water from the absorbent solution. Thus the same energy source used for winter heating will also power the cooling equipment, permitting operating and installation economies.

The boilers and absorption units will be on public display in a glass wall apparatus center. +

Question of the Month

How Can We Collect Oil Mist?

"We are trying to determine the most suitable method for collecting the mist emanating from the contact of cutting oil against high speed grinding spindles in our plant. Because of several reasons, we are not in a position to use the electronic type of precipitator."—C.N.

THE QUESTION, *How Can We Collect Oil Mist?*, was asked previously in HPAC. It was then published along with several answers from readers in the March HPAC. Now, two more solutions to the problem are offered this month. Other answers for publication will also be welcome.

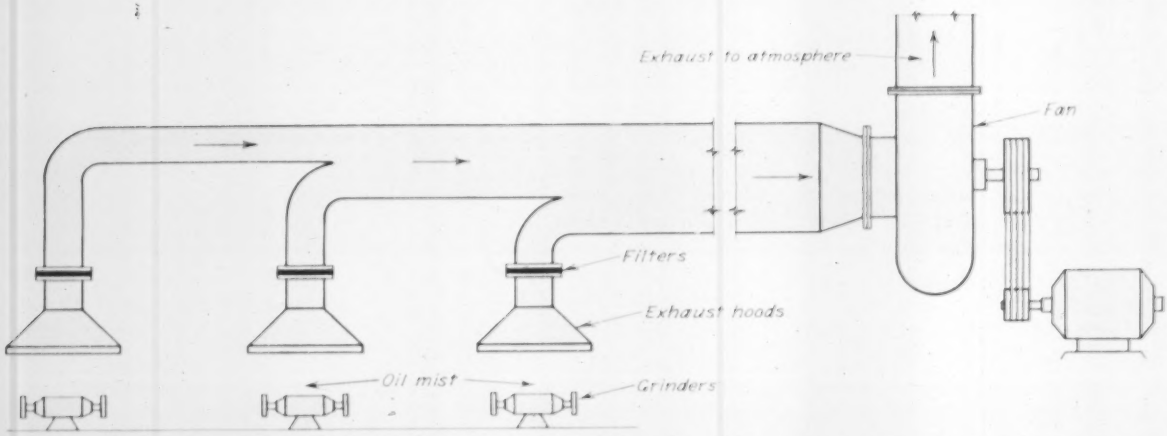
Use Carbon or Air Filter in Flanged Exhaust Hood, with Minimum Velocity

MISTS are small airborne inert liquid particles — droplets — of materials, suspended in air at normal temperature and pressure. They may be formed by atomization, spraying, splashing, mixing, violent chemical reaction, electrolytic evolution of a gas from a liquid or escape of a dissolved gas resulting from reduction of pressure. Mists and fogs have particle sizes ranging from 0.01 to 10 microns.

Several means are available for removing mists from air, depending on particle size and chemical composition. For sizes to approximately 0.05 microns, activated carbon sorption is recommended for oil mist removal. Above this size, catalytic combustion or air filters are suggested. The former is suitable to 0.1 microns and the latter finds application for particle sizes ranging between 0.1 and 1000 microns.

Adsoprtion is a physicochemical property possessed by a number of substances, with activated carbon — charcoal — being a material well suited for mist removal, having affinity for many gases and vapors. The required quantity and useful life of carbon as a filter medium vary with the type of service. For many applications, approximately 60 lb of carbon per 1000 std cu ft of air per hr is the minimum, with greater amounts required for highly concentrated air streams. Average carbon life ranges between 6 and 12 months.

The principal limitations of carbon used as a sorbent



HOOD OVER EACH GRINDER — as close to source of air-mist as conditions allow — in this installation for collecting oil mist has replaceable filter of activated carbon. Air filters may be used instead for larger particles. Control velocity of exhaust air ranges from 500 fpm at hood inlet to 2000 fpm at hood outlet

are temperature and mist concentration. In atmospheres above 100 F, activated carbon loses its efficiency and it is usually necessary to cool the airborne mist or mix it with cooler air to obtain effective sorption. This is borne out by the fact that carbon is reactivated — freed of gases and vapors — by application of heat.

The attached sketch shows one means of collecting oil mist resulting from grinding operations. This arrangement has a hood over each unit. A replaceable carbon filter is installed in the duct leading from the hood. Air filters may be installed in lieu of carbon if particle size exceeds the values given above.

For effective removal of mists, a minimum air velocity — control velocity — is required to direct the air stream into the collecting hood. Control velocity is the air speed created by the hood at the grinder as required to collect a reasonably large quantity of mist. This value ranges from 500 fpm at the hood inlet to 2000 fpm at the hood outlet. The hood should be as close to the source of the air-mist stream as physical conditions will allow.

Use of flanges around the hood opening will reduce air flow from the ineffective areas behind the hood and tend to increase the efficiency by forcing the air stream to flow from the zone directly in front of the hood. Flange height should be approximately one-third of the hood depth, in which case the air volume for a given velocity in the effective zone will be nearly 75 percent of the air volume required by a hood without a flange.

H. B. WAYNE
Consulting Engineer
Woodhaven, N. Y.

READER ASKS—

"How Can I Maintain Adequate Gas Pressure at Boiler Burner?"

"I have presently installed for a commercial heating installation, a steel fire tube low pressure steam boiler, approximately 700,000 Btu per hr gross capacity, with an up-shot type butane burner.

"The butane tank is installed underground and approximately 30 ft from the boiler. I am unable to maintain sufficient gas pressure at the burner, and it has been recommended that the butane tank should be heated to remedy this situation.

"Any suggestions or comments that HPAC readers could give me regarding this situation will be appreciated. Also I would like to know if under the existing circumstances an oil type burner would be warranted."—L.A.I.

• *YOU ARE INVITED to contribute a question for publication or an answer to a published question. Write: The Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

High Velocity Air Filters Used to Separate Oil Mist

THE PROBLEM of collecting cutting oil mist from a high speed finish grinder was solved in one plant recently with a very ordinary device. This was mentioned very briefly in my answer to this question in the March HPAC. Since the problem is not uncommon, a few details of our method of solving it may be helpful.

As this problem is similar to that of collecting mist from cooking fats in a kitchen, we used the same solution that we would use in a kitchen. We centered a generously sized hood over the source and suspended a V-type filter assembly in the hood.

Standard type high velocity air filters of wire mesh are used to separate the oil mist from the air. The arrangement of the filter in the V assembly causes the oil to flow downward through the filter to a drip pan below the V assembly, and a copper tube carries the oil back to the grinding machine.

KENNETH M. BAKER
Dust Control, Inc.
Hawthorne, Calif.

Air Conditioning Is Sound Investment, Bankers See

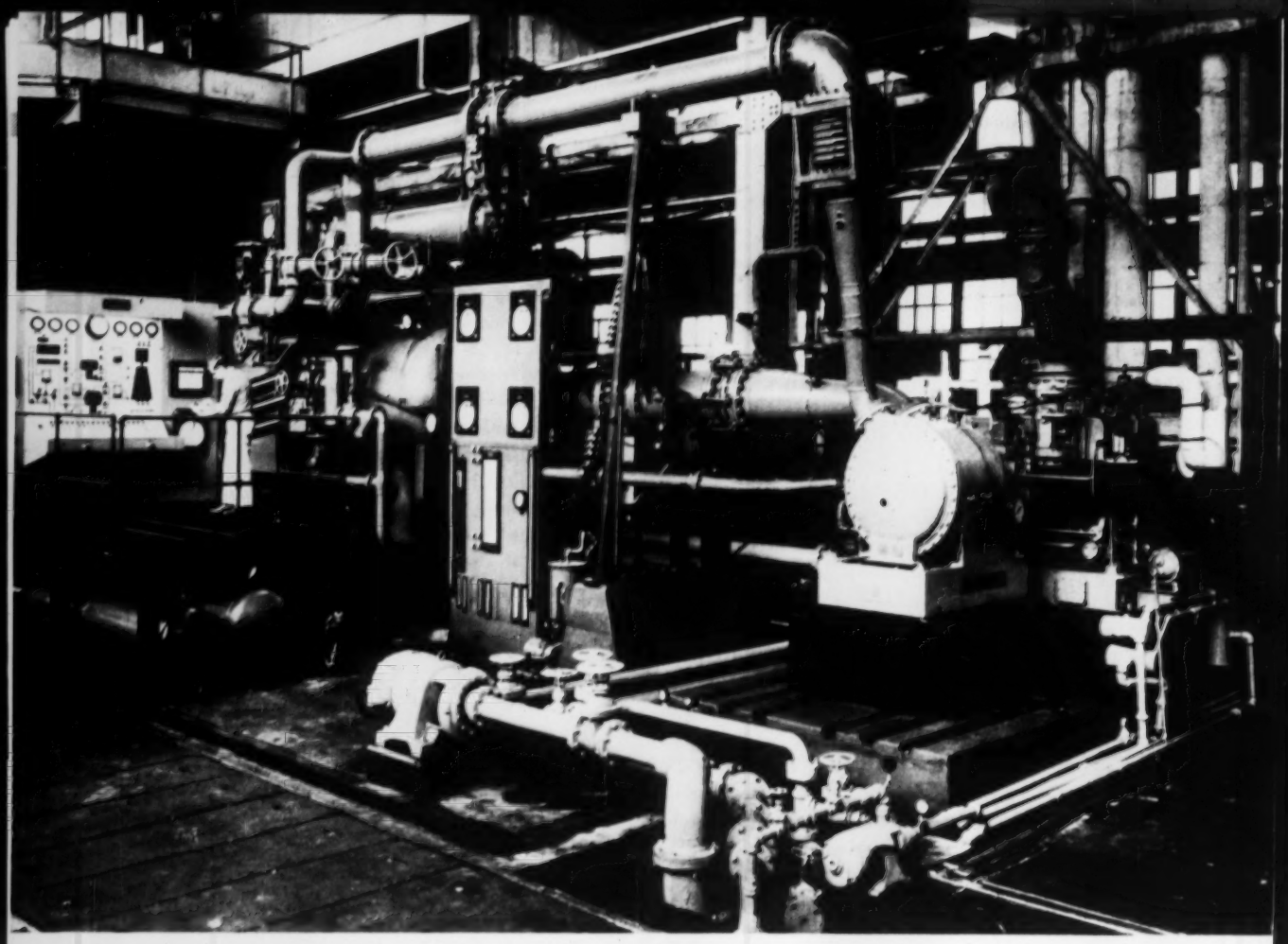
. . . big building modernization stressed at convention

MORE than 10,000 banking authorities meeting in Los Angeles recently, for the American Bankers Association 82nd annual convention, saw at first hand how the inclusion of air conditioning in big building modernization programs helps achieve maximum revenue returns, prevents obsolescence, and protects investment, according to A. C. Menke, vice president of The Trane Co.

Mr. Menke told the convention that increased revenue generally follows when an older building installs air conditioning.

He said, "Tenants of rental buildings frequently demand air conditioning. In some instances, these people move from non-air conditioned, lower rental buildings to those with higher rentals simply because they are air conditioned."

He also reported, "We believe that lending institutions which encourage the use of air conditioning will find it improves the competitive position of buildings to hold old, and attract new tenants. And, as a consequence, the overall investment is likely to be more sound."



Closed Circuit Test Loop Of Piping, Fittings, Valves

. . . speeds compressor research

BY CHARLES A. MACALUSO

Assistant Chief Engineer
Compressor Engineering Dept.
Worthington Corp.

A NEW RESEARCH TOOL was recently unveiled by our company at its Harrison, N.J., research and development laboratory. The facility is a closed circuit test loop for testing new designs of centrifugal compressors for air conditioning and refrigeration systems. The loop is also used to determine performance ratings and for production quality control. An electronic computer calculates test results quickly, saving many man-hours.

The new test loop causes the compressor to function in the usual manner; however, no heat is added at the low temperature level, and only the heat of compression must be removed from the gas at the high temperature and pressure level.

Piping Is Seamless Carbon Steel

The test system is a closed loop comprised of piping, fittings, valves, and tanks. The piping is ordinary carbon steel seamless pipe fitted with slip-on welded flanges. The fittings used are primarily welding fittings.

The pipe diameters are as follows: suction, 20 in.; discharge, 14 in.; flash line, 4 in.

NEW TEST LOOP — known as an automatic, spray desuperheating, closed system — is used for research and development testing of centrifugal refrigeration compressors. New facility permits testing over an extremely wide range of simulated field conditions. Compressor, right, is driven by a steam turbine. Centralized control panel, left, permits operator to control operation and obtain quick readings of flow, pressure, and power consumption at each test point.

Several types of valves are used. In the larger sizes, for on-off operation or for minor throttling, double disc gate valves — nonrising stem — are used. In order to satisfy the refrigerant vapor leakage requirements, the unsatisfactory conventional packing rings were removed and the gland was fitted with a double "O" ring seal. For wide ranges of throttling with accurate control, diaphragm control valves are used. In the smaller sizes — 1 in. or less — packless valves commonly used in refrigeration service are employed.

Pneumatic control valves are used for the throttling from condenser pressure to suction pressure. A double seated, globe valve with equal percentage plug is used to obtain quiet throttling and good control. These valves are equipped with stainless steel trim, teflon packing, oil seals, and pneumatic power positioners.

Use Steam Turbine Drive

The compressor to be tested is mounted on a base and connected to a steam turbine driver. A specially designed steam turbine is used for the compressor driver because of compactness, plus wide ranges of speed and power. The turbine is equipped with hand nozzle valves, 4:1 governor speed control range, remote controlled speed changer and trip, and has speed droop control.

After starting, automatic control systems come into play to bring the compressor to a prescribed set of operating conditions. Flow, pressure, temperature, power consumption, etc. are measured and fed into an electronic computer which translates the figures into useful performance characteristics.

Divide Discharge Gas

In the new closed loop, the gas discharged from the compressor through the discharge line is divided; part of the gas passes into a shell and tube type condenser, where it is liquefied, and the balance is further divided between two desuperheaters.

One desuperheater cools the gas to a prescribed compressor suction temperature. The other provides the cooled gas for the interstage flash gas connection of the compressor being tested.

The liquid from the condenser flows to the hot wells of the desuperheaters through level control valves; and hot well pumps deliver the condensate to the desuperheater spray headers.

The condenser is a conventional shell and tube type, sized to handle maximum loading at a low terminal temperature difference which permits tests to be conducted at minimum discharge pressures. A small liquid receiver is provided to store excess quantities of condensate which may exist during transient operation. A noncondensable gas purger is used to remove any inert gases from the condenser.

For the critical control of gas temperatures, extreme care was exercised in the design of the desuperheaters. The gas desuperheaters are of a special, horizontal design which minimizes space requirements and preserves the general simplicity of the basic closed loop. The large volume of the in-line desuperheaters also serves as a plenum and flow straightening chamber.

Condensate is recirculated from the hot wells by centrifugal hot well pumps at the rate of three times the theoretical amount required to insure controlled cooling of the gas. The liquid is dispensed through spray headers to insure complete mixing of liquid and gas.

Meter Piping, Orifices Carefully Selected

Thin plate orifices are used to measure the flow of the test gas and the water to the condenser. The thin plate orifice was selected for flow measurement because the primary element can easily be replaced to maintain optimum sensitivity. Flow measurement stations are in the suction, discharge, and interstage flash gas lines. The orifices are used in fittings which facilitate the rapid change of plates without stopping the test or losing test fluid. Blank plates are also used in the fittings, as line

blinds, permitting compressor changes to be made without loss of test fluid or the need for additional valves or removal of test fluid.

The pipe for metering runs was carefully selected for concentricity, smoothness, and uniformity. The orifice fittings are bored to suit, aligned, and dowelled to the flanges of the metering run. The series of orifice plates selected has a turn down ratio of flow of approximately one-half for each size. The orifices are made in accordance with Part III of the American Society of Mechanical Engineers Code on Fluid Meters.

All bolted joints are gasketed and coated with a refrigerant sealing compound. The entire system was leak tested with an electronic halogen leak detector, with final acceptability based on a test for loss of vacuum. The entire system was evacuated to an absolute pressure of 0.1 in. of mercury; a maximum rate of leakage of 0.01 cfm of free air is considered satisfactory.

Any condensable test fluid may be employed that falls within the range of system design conditions. To date, only the nonflammable, nontoxic, fluorinated hydrocarbon compounds commonly used in refrigeration service have been used.

Control Tests, Get Results from Panel

The piping systems are painted in various colors for identification, and a graphic control panel schematically shows the piping system. The graphic panel shows all the principal test system components, flow directions, controllers (miniatures), and operating pilot lights.

A pneumatic system is used to transmit and control the process variables. The transmitter permits local mounting of the sensing element with remote centralized control. All controllers are adjustable and employ proportional band and auto reset control (rate action is used where required). The controllers may be bypassed where manual control is desired.

As saturation temperature is required for many test conditions, a pressure transmitter with adjustable proportional band is employed to automatically reset the control point of a temperature controller to compensate for pressure changes.

In many cases, sequent operation of a pair of control valves is desired. To accomplish this, split spring control is used wherein each of the valves employs a diaphragm spring whose range corresponds to only one-half of the controller output signal, and by using a slight overlap a smooth response is attained.

The effect of a wet suction on a compressor is ascertained by spraying liquid into the suction line. The quantity of the liquid injected is measured by one of a series of rotameters.

When the compressor is up to test speed, the desired discharge pressure is set by means of throttle valves between the compressor and condenser. A portion of the flow is condensed. A part of the remainder of the flow is throttled to a desired interstage pressure, and a part to suction pressure. The suction pressure control is effected by a pair of automatic control valves. A condenser pressure controlled system, meanwhile, automatically maintains constant condensing pressure.

From the graphic control panel a single operator can control and obtain the results at each point of a test run. The panel is a schematic of the test loop with all major components indicated. Mounted on each side of the panel are the direct reading potentiometers for indicating and recording temperatures, and direct reading flow recorders. The flow recorders contain mechanical antilog computers with compensating bellows and cams, for use with the various refrigerants to be tested. The flow recorders provide a direct reading of flow quantities, accurate within ± 2 percent, primarily used for setting up test points. Final flow calculations are performed by electronic computation.

Miniature control indicators on the face of the graphic panel tell at a glance whether the conditions are at the set point or how closely they approach it.

Calculate Performance Curve

To obtain a test performance curve, an electronic digital computer is used to reduce the test data into a final form. Six hundred and three programmed steps are required to completely evaluate the real fluid thermodynamic relationships of the gas and the performance of the compressor being studied. The data received from the loop tests is punched on cards. These cards are fed into the electronic computer along with programmed instructions.

All the calculated performance parameters are tabulated and punched out on result cards, which include an 18 digit code so that files can be automatically searched under various categories by punched card sorting equipment.

The electronic computer equipment and the card sorting equipment is enclosed in a separate room, air conditioned by a packaged air conditioning unit to maintain the constant temperature and humidity conditions required for the mechanical and electronic components. ≠

TABLE 1—COMPRESSOR OPERATION is automatically controlled according to a prescribed set of conditions within the ranges below

Suction pressure, psia	to 165
Discharge pressure, psia	to 250
Suction temperature, F	−50 to 50
Discharge temperature, F	to 250
Suction gas flow, cfm	300 to 12,500
Speed, rpm	3000 to 12,000
Horsepower	to 2,600

TABLE 2—ADVANTAGES OF NEW SYSTEM are obvious when compared with central station refrigeration test system formerly used

	Central station refrigeration test system	New desuperheating system (closed loop)
Operating team	5	1
Test time per point, min	60	30
Calculation time per point	2½ hr	10 min
System flow range, ratio	4:1	40:1

On the Job

How to Avoid Boiler Explosions

. . . by prescribing flame failure safeguard control incorporating program timing, and by giving attention to draft conditions, air supply, air intake, fuel supply, and combustion chamber design

BOILER OR BURNER EXPLOSIONS are a real danger when equipment is improperly specified, incorrectly designed, or incorrectly installed, according to L. D. Sibley, vice president of Combustion Control Corp.

A Pennsylvania elementary school recently suffered its third severe boiler explosion, shattering all first floor windows and wrecking the boiler room. The brick setting for this 60 hp boiler was improperly installed, as there was no interlocking between side walls or rear and front walls. The only opening for air into the boiler room when firing a standard rotary cup heavy oil burner was an 8 by 8 in. opening in the brickwork.

Another case involved a $300,000 explosion in a new boiler room for a new hospital wing, killing two men and injuring five others. Investigation showed that unqualified and untrained personnel turned on the fuel supply to one of the steam atomizing burners and 30 seconds later applied a lighted torch to the combustion chamber, which, by this time, was filled with atomized fuel.

With no preset timing to insure thorough purge of the combustion chamber in a manually operated burner, the operator may not get all unburnt fuel, occasioned by leaking valves, up the stack. When lighting off the main fuel with a swab or gas torch, the igniter may stay lit or go out due to high draft in the attempt. He may delay applying the torch and then ignite a fully charged combustion chamber of unburnt fuel. Interruption of air or fuel supply while the main burner is firing can cause flame-out, and, if the defect automatically clears, he is injecting unburnt fuel into a hot combustion chamber, which can light off explosively.

To avoid the hazard, eliminate this type of firing as there are available satisfactory igniters developed by burner manufacturers for all types of industrial fuel burning equipment.

With semiautomatic fired burners, purging of the combustion chamber is left to operating personnel. At the end of purge time, he pushes a button to establish a gas electric torch, and, seeing that the torch is ignited, turns the hand valve open, lighting off the main flame.

A minimum of three air transfers of all air in the combustion chamber, passes, breeching, and stack before bringing any flame into the combustion chamber is recommended. It is simple to compute prepurge time established by a sealed, tamperproof timer, knowing dimensions of area involved and cfm of fan equipment. At the end of prepurge time, the operator pushes the momentary start button to power the electric gas igniter, and, with a flame failure safeguard to monitor the pilot at a point which will safely light off the main fuel, can watch the signal light indicate that the pilot is established. He then removes his hand from the momentary start button, which has completed the electrical circuit to the safety shutoff valve in the main fuel line, and slowly opens the main fuel valve. If the pilot fails at any time during this critical light off period, the safeguard will immediately de-energize the igniter and reset the prepurge timer.

If main flame failure should occur due to fuel or air interruption, the safeguard will de-energize the main fuel safety shutoff valve, reset the purge timer, and ring an alarm to bring the shutdown to the operator's attention. To eliminate the constant burning pilot hazard, a second timer should turn the pilot off automatically when the main flame reaches high fire.

Most full automatic fired burners depend on surveillance by "competent" operating personnel. Due to physical limitations occasioned by the complexity of equipment, it is usually impossible for the operator to tell whether the pilot is fired at a point which will light off the main fuel.

By prescribing flame failure safeguard control incorporating program timing, hazards are practically eliminated. Upon calling for heat, the programming control will automatically bring blower equipment to thoroughly purge the combustion chamber, all passes, breeching, and stack; then bring the pilot, prove the pilot at a point for satisfactory light off of main fuel, bring on main fuel in low fire position, turn off pilot, monitor main flame, and, when flame failure occasioned by momentary fuel or air interruption occurs, de-energize the main fuel shutoff valve in two to four seconds.

Sequencing and automatic monitoring throughout the most hazardous periods of firing industrial burners does not eliminate all hazards, such as partial fuel burning in the combustion chamber. This results in an unburnt fuel accumulation in passes or breeching which can be ignited explosively. To avoid this, attention should be given to draft conditions, air supply, air intake, fuel supply, and combustion chamber design.

On the Job
—notes from the field

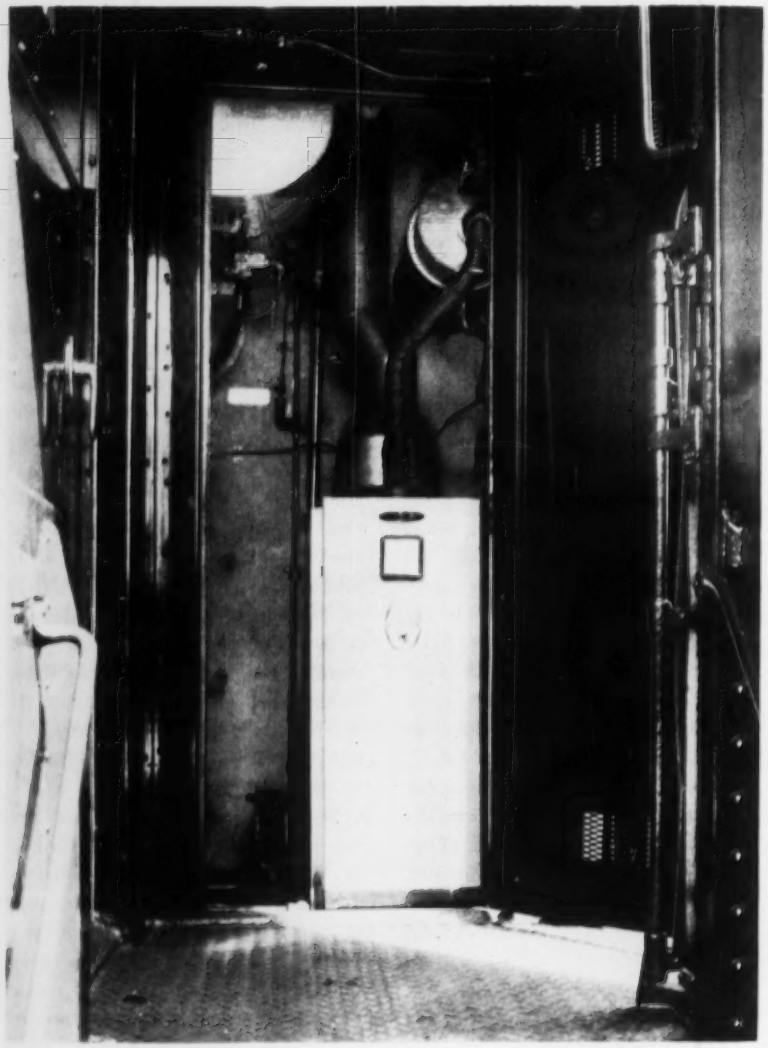
Gas Fired Boilers Heat Railway Cars

. . . also operate cooling systems

SEVERAL gas fired hot water boilers have been efficiently heating three special Great Northern railway business and instruction cars for several years, according to the Bryant division of Carrier Corp.

Unlike conventional passenger cars, these cars often are not a part of any train, but are rather shuttled from siding to siding.

Previously, when one of these cars was "set out," heat was provided by a hot water system using a coal fired stove.



"TRAVELING" BOILERS heat special railroad cars. When a car is "parked" on a siding, the boiler heats a water and antifreeze solution that is circulated through the car's piping by electric pumps. When it is rolling, the circulating liquid is heated by train line steam that passes through the heat exchanger

While remodeling and modernizing these cars in St. Paul, Minn., Great Northern designers sought a different type of heating unit. The gas fired boiler in each car operates for more than 24 hr on one tank of bottled gas, even in sub zero weather. Input capacity of each boiler is 135,000 Btu per hr. Special controls are required for railroad operation.

Its compactness — 37⅛ in. high, 16⅛ in. wide and 28½ in. long — allowed the railroad to install it on one side of the vestibule. Passengers can still enter from the other side with room to spare.

On the latest Great Northern car to be so equipped — an air brake instruction car — six LP gas cylinders are carried in compartments under the car.

The heating system can be operated with train line steam when it is rolling along the rails, or from the boiler when it is on a siding.

To prevent winter water freeze-ups, the radiators — copper fin piping — are filled with an antifreeze-water mixture, and the liquid is circulated through the closed system by electric pumps.

When the car is rolling, this liquid is heated by a cylindrical heat exchanger using train line steam. The boiler takes over automatically when the car is immobile on a siding.

Five thermostats control separate radiators through motorized valves. They also control the cooling system — gas operated — in summer.

Supplying electrical energy is a 5 kw axle driven safety generator, supplemented by a 7 ½ kw propane generator.

All regulating equipment for the heating, cooling, and electrical plants was specially developed for this application and is in a cabinet close to the boiler. Whether the car will be heated or cooled depends only on outside temperature, and the switch is made automatically. ≠

Teamwork Needed to Solve Problems Of Air Conditioning Old Buildings

. . . speaker tells National District Heating Association meeting. Limiting maximum hourly steam demand by installing a demand controller was another topic at the meeting. Other subjects were previously reported in the July and November HPAC's.

BY JOHN F. COLLINS, JR.

Secretary-Treasurer
National District Heating Association

UNDER THE TITLE, "A Contractor's Look at the Air Conditioning of Existing Office Buildings," Peter B. Gordon, vice president of Wolff & Munier, Inc., and this year first vice-president of the American Society of Heating and Air-Conditioning Engineers, gave some excellent advice on procedure in handling jobs in existing office buildings during the air conditioning committee program. This program was headed by Robert D. Martin, of the Consolidated Edison Co. of New York, Inc.

With 20 years of experience in the field, Mr. Gordon said that no two jobs will work out the same in existing multistory office buildings. A bad approach may result in excessive costs, unsatisfactory results, or a decision to abandon the improvement.

A team consisting of the representatives of the consulting and designing mechanical engineer, the construction organization, and the mechanical and electrical installation contractors is needed from the beginning to consider cost, convenience, and timing with the owner.

In addition to timing, the other most serious problems are how to distribute the air conditioning effect, which of the several methods of providing refrigeration should be used, and where and how to provide cooling towers.

M. J. Pitre, vice-president of the America Fore Insurance Group, described how they modernized their 43 year old, 26 story steel frame building at 80 Maiden Lane in New York's downtown insurance and financial area. The structure has brick, terra cotta, and limestone walls, and concrete foundations. It is built on caissons and has two basement levels. The building volume is 6.6 million cu ft, and the gross area is 495,000 sq ft. The net, rentable area before modernization was 350,000 sq ft; about 5 percent more afterwards.

An examination of the structure, its corridors, partitions, and flooring, as well as its heating plant and other facilities, resulted in a decision to modernize: to tear everything out of the interior, including the radiators, one or more floors at a time, leaving only the hung ceilings. Changes to the elevators, lighting system, telephone system, and the structure itself will not be described here.

Leaving the four old 150 psig water tube boilers in place — which still probably were good for five or six years' use — was considered, but the space they occupied was needed for the air conditioning equipment. When it was found there was an estimated saving of $156,725 by locating the equipment there and using the smokestack space for a pipe shaft, it was decided to purchase steam.

After study of the available types of air conditioning, it was decided, Mr. Pitre said, that for their structure it was best to install a 1350 ton compressor refrigerating plant with a high velocity perimeter unit system and a standard low pressure interior system.

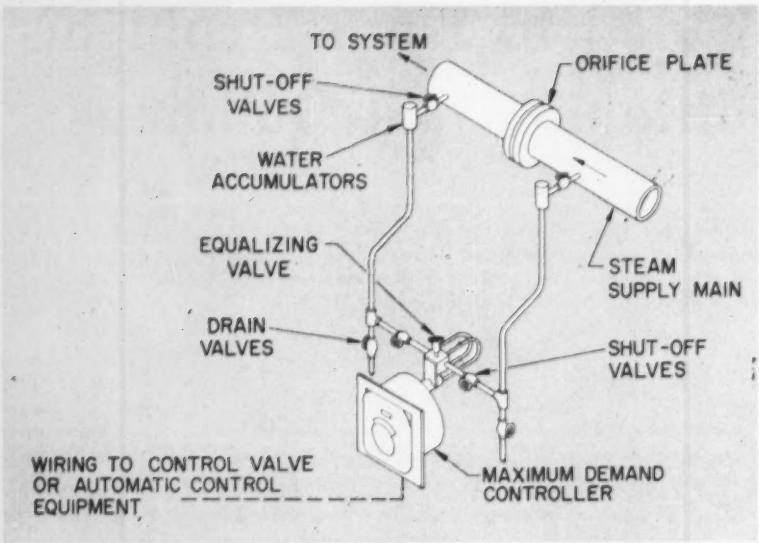
Electric and steam power was considered, and it was agreed that steam driven turbines would produce more flexible and economical operation for $7950 less per year.

When it was found it required 12 weeks to modernize one floor, 18,000 sq ft was leased in an adjoining building, permitting the modernization of four floors simultaneously.

Probably not all the increased efficiency can be ascribed to air conditioning alone, but since modernization, Mr. Pitre said, there has been an increase of 9.3 percent in the number of letters transcribed by dictaphone operators and a reduction in absenteeism resulting in an estimated annual saving of $30,400.

• Controller Limits Maximum Hourly Steam Demand

In many cities, the rates of district heating companies include a charge based on the maximum hourly steam demand, which makes the limiting of such demand very important. In a paper on the program of the research committee, whose chairman is Robert W. Swoyer, of the Pennsylvania Power & Light Co., Carl B. Sprenger, engineer, customers' steam service of The Detroit Edison Co., described the installation and operation of a demand controller, which holds the maximum hourly demand for steam within the limit set.



MAXIMUM DEMAND CONTROLLER, consisting of a steam flow meter with an electric contactor which regulates the flow of steam to the heating system, was installed in a 16 story hotel at a cost of $2400. Estimated saving the first year was $785; the next year, $1225

The equipment consists of a steam flow meter with an electric contactor which regulates the flow of steam to the heating system when the set demand is approached.

An example was given of its operation in a 16 story hotel having four heating zones, as follows:

1) Night club air conditioning system thermostatically controlled.

2) Lobby and coffee shop vacuum heating system having direct radiation, outdoor thermostat and timer.

3) Bathroom vacuum heating system risers, with outdoor thermostats and timer.

4) Other upper floor vacuum system risers supplied through a modulating flow control, with radiator orifices and differential pressures across them controlled by outdoor temperature.

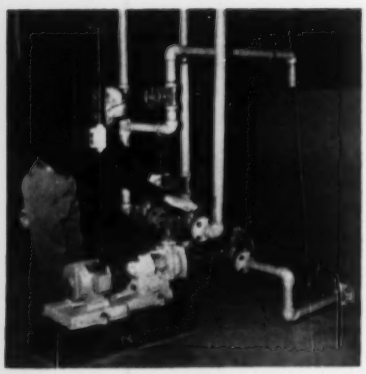
Domestic hot water is supplied from an instantaneous water heater. Two medium size washers in a laundry on the top floor frequently overtax the output of the 1500 gal domestic water heater.

At one time — when the night club heating system to avoid excessive demands was not turned on until afternoon — the billing demand varied from 4050 to 4940 lb per hr. In 1952-53, with less operating force to control steam use, it was 4950 lb per hr.

A steam flowmeter, measuring all use and having a demand attachment, was installed in 1954 at a cost of about $2400. It provides a record of use. The controller does not shut off steam entirely. It operates on the upper floor risers only, and in compliance with the features of the rate it does not limit use until 8 a.m. In 1954-55 the demand was decreased to 4500 lb per hr. The estimated saving was $785 and the next year it was $1225. ⧺

Use PVC Piping for Chromium Plating

. . . in four acid recovery and solution purification processes



UNPLASTICIZED polyvinyl chloride piping systems form part of the new $50,000 chromic acid recovery and solution purification facilities at the Perfect Circle Corp.'s plant, Hagerstown, Md., according to Tube Turns Plastics, Inc.

In the first of four applications, $1\frac{1}{4}$ in. and $1\frac{1}{2}$ in. lines are employed on the deionizer. Deionized water instead of distilled water is used since it most economically meets the company's needs. The elimination of ions from the process water prevents plating imperfections.

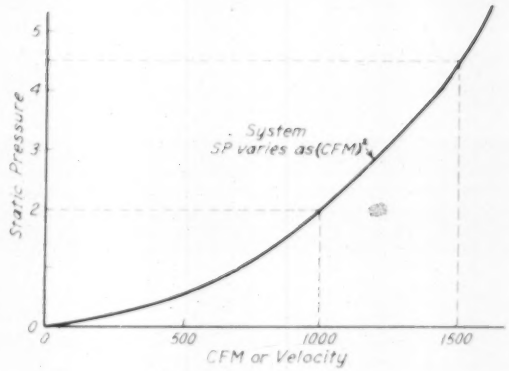
In the second application, 2 in. lines serve a 1500 gal dilution tank where chromic acid is handled in concentrations of 10 to 40 percent.

Lines ranging from 1 in. through 2 in. serve a 1500 gal adapter tank where water containing a 1 percent concentration of chromic acid is processed in the third application.

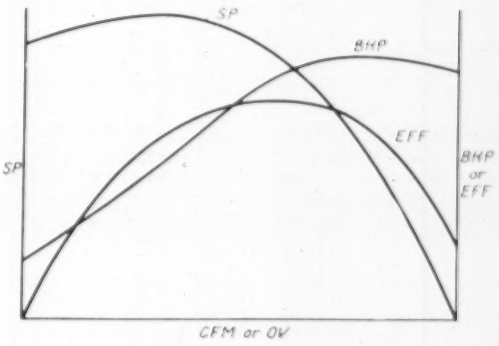
In the fourth application, a $2\frac{1}{2}$ in. line is employed for drainage of regeneration wastes.

The PVC operating pressures are 25 to 75 psi. Temperatures range from 50 to 90 F.

The installations were fabricated with injection molded fittings. Dallas Lunsford, the company's chief metallurgist, was the project engineer, and the installations were made by C. L. Gough, plating engineer and his staff. ⧺



1 SYSTEM CURVE shows possible static pressure vs cfm relationships



2 FAN PERFORMANCE CURVE shows lab test performance*

Fan Laws and System Curves

BY C. JACK TRICKLER
Chief Engineer
The New York Blower Co.

THE FEW RULES that engineers use to predict fan performance are quite simple. The purpose of this article is to show their origin and application.

"System Laws" Is Better Name

Although the three fundamental rules of fan performance are commonly called "fan" laws, it would be proper to call them "system" laws. A "system" is any grouping of duct, filters, registers, grilles, collectors, plenum chambers, etc., through which air is pushed or pulled.

Cfm-Static Pressure Relation Cannot Change

Any motion causes friction. When air moves through a system, there is friction between the air and its surroundings (duct walls, filter openings, etc.) and within the air itself. Energy must be supplied to overcome the friction. The faster the air moves, the greater the friction and the energy that must be supplied to push or pull the air. The energy is supplied as pressure. That portion of the pressure which creates velocity is called velocity pressure. That portion which is supplied to overcome friction losses is called static pressure (sp). The sum of the two is called total pressure.

The law of physics for any motion is expressed as

$$V = \sqrt{2gh} \text{ or } V^2 = 2gh \quad \ldots\ldots\ldots [1]$$

where V = velocity of flow; g = force of gravity; and h = pressure causing flow.

The pressure to cause flow is proportional to the square of the velocity. On a system this means the static pressure varies as the square of the velocity and cfm. Knowing this, it is possible to predict the sp that will be needed to push any cfm through a system if only one sp vs cfm relationship is known.

For example, imagine a system where 2 in. of water pressure (2 in. sp) is required to push or pull 1000 cfm. If it is desired to increase the flow to 1500 cfm, then the sp required would be

$$(1500/1000)^2 (2) = 4.5 \text{ in. sp} \quad \ldots\ldots\ldots\ldots\ldots [2]$$

A graph of all possible sp vs cfm relationships is called a system curve. The above example is shown in Fig. 1.

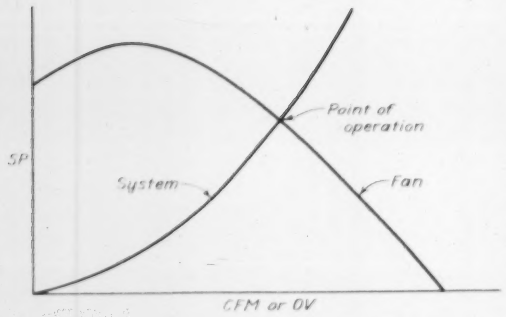
No matter what amount of air flows through the system or the type and size of fan used to push or pull the air, the relation of cfm and sp cannot change: Sp always varies as $(\text{cfm})^2$.**

*OV represents velocity at fan outlet.

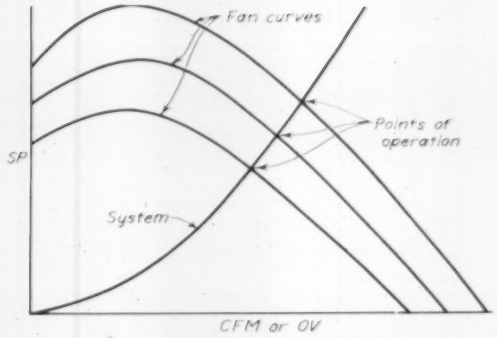
**Almost all air flow involved in fan application occurs in the turbulent range where this relation is correct. If the flow is laminar, the sp varies directly with the air flow change. An occurrence of this is in certain special very low velocity filters.

The factors which determine whether flow is turbulent or laminar are the velocity and cross sectional area of passageway. An interesting example of this is seen in the flow through packed grain. Flow through large grains of corn is nearly completely turbulent. The same volume flowing through very small clover seed is nearly completely laminar. Intermediate size grains show a combination of laminar and turbulent flow.

Tear out along this line
HPAC DATA SHEET



3 COMBINED CURVES intersect at only point where fan and system combination can operate



4 FAN SPEED VARIATION causes point of operation to move to right or left on system curve

Three "Fan Laws" Act Simultaneously

A fan wheel acts very much like a shovel. Every time it revolves it discharges the same quantity of air. On a system the fan will discharge the same volume of air each revolution regardless of fan speed and air density, disregarding small effects of compression at high pressure. If the rpm of a fan is increased, the fan delivers more air through the system in exact proportion to the change in fan speed. This gives the "First Fan Law":

1) Cfm varies as rpm.

On a system the sp varies as the square of the change in cfm. Therefore, it changes as the square of the fan rpm. Hence the "Second Fan Law":

2) Sp varies as $(\text{rpm})^2$.

The nature of fans is such that they operate at the same efficiency at all points on a system. When fan rpm is changed, the cfm changes proportionately and the sp as the square. The brake horsepower therefore varies as the cube of the change in the rpm. This gives us the "Third Fan Law":

3) Bhp varies as $(\text{rpm})^3$.

It is important to note that all three "Fan Laws" act simultaneously and any calculations must be so made.

Fan and System Curves Show Relationships

As stated above, a system curve shows graphically all possible combinations of cfm and sp for a given system. Any combination of fan and system must operate somewhere on the system curve.

Laboratory tests establish fan performance and show that, regardless of the system, the fan must operate somewhere on its performance curve, as shown in Fig. 2, except as that fan's characteristics are modified by poor inlet connections. See the July HPAC Data Sheet. Because the fan and system can each operate only somewhere on its own curve, the combination can operate only where their curves intersect, as shown in Fig. 3.

If the fan speed is increased or decreased, the point of operation will move up toward the right or down toward the left on the system curve, as shown in Fig. 4.

Here are two examples to show the application of the "Fan Laws."

Example 1. A fan has been selected to deliver 35,530 cfm against an 8 in. sp. The fan runs at 1230 rpm and requires 61.0 bhp. After installation it is desired to increase the output 20 percent. At what rpm must it run? What sp will be developed? What bhp will be required?

1) Cfm varies as rpm.

$$(1230)\ (1.20) = 1476 \text{ rpm} \quad \ldots\ldots\ldots\ldots\ldots\ldots [3]$$

2) Sp varies as $(\text{rpm})^2$.

$$(1476/1230)^2\ (8) = 11.52 \text{ in. sp} \quad \ldots\ldots\ldots\ldots\ldots\ldots [4]$$

3) Bhp varies as $(\text{rpm})^3$.

$$(1476/1230)^3\ (61.0) = 105.04 \text{ bhp} \quad \ldots\ldots\ldots\ldots\ldots\ldots [5]$$

Example 2. A fan was installed to deliver 10,300 cfm at 2¼ in. sp and to run at 877 rpm requiring 5.20 bhp.

After installation it is found the system only handles 9150 cfm at 2½ in. sp and uses 4.70 bhp. This indicates the original calculations were in error. What fan rpm and bhp will be necessary to develop the desired 10,300 cfm? What sp should have been figured?

1) Cfm varies as rpm.

$$(10{,}300/9150)\ (877) = 987 \text{ rpm} \quad \ldots\ldots\ldots\ldots\ldots\ldots [6]$$

2) Sp varies as $(\text{rpm})^2$.

$$(987/877)^2\ (2.50) = 3.17 \text{ in. sp} \quad \ldots\ldots\ldots\ldots\ldots\ldots [7]$$

3) Bhp varies as $(\text{rpm})^3$.

$$(987/877)^3\ (4.70) = 6.70 \text{ bhp} \quad \ldots\ldots\ldots\ldots\ldots\ldots [8]$$

Fan performance tables and curves used by fan manufacturers are based on these three basic "Fan Laws." There are a great many other considerations which enter into an individual fan selection such as heat and altitude — see the July Data Sheet — but these are variations of the fundamentals shown here. Application of these rules will aid in fan selection, in understanding fan behavior, and in finding errors of system design or field application. ‡

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

Heating, Piping & Air Conditioning

Journal Section

of the

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

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BETTER READING

The introduction of this page to open up the JOURNAL SECTION is the first of a number of changes now in the planning stage. All are aimed at making the Section more readable and more useful. Included is a plan to make the Society organization more readily understood, to improve appearance, and eventually to open the way for more papers.

RADIOACTIVE VENTILATION

The paper on this subject beginning on page 117 is the first release of information to the profession concerning what the A.E.C. is doing to solve the problem. You will want to read it.

THE CHICAGO MEETING

With the Exposition being held at the same time as the Annual Meeting next February, hotel space in Chicago will be at a premium. Better reserve a room early. The Society meeting program is well along (see page 126).

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SOCIETY COMMITTEE ORGANIZATION

GENERAL COMMITTEES: The Society By-Laws provide for nine such committees. A list with the names of their members is included in this issue on pages 134-35

RESEARCH COMMITTEES: The research program is under the guidance of the Committee on Research — a General Committee. The Committee on Research appoints Technical Advisory Committees as needed. A list, with current membership, can be found in this issue of the JOURNAL on pages 134-35

SPECIAL COMMITTEES: At present there are nine of these committees. A list of them and of their personnel is included in this issue of the JOURNAL on page 135

NOMINATING COMMITTEE: This committee's membership is fixed by the By-Laws. Present membership can be found in this issue of the JOURNAL on page 135

SOCIETY REGIONAL ORGANIZATION

Names of the Regional Directors and a list of members of the Chapters Regional Committee can be found in this issue of the JOURNAL on pages 134-35

SOCIETY CHAPTERS AND BRANCHES

The Society has chartered 65 Chapters, 6 Student Branches and 1 Special Branch. These groups elect their officers and governing boards. A list appears in this issue of the JOURNAL on page 136

The President's Page

Fall Council Meeting

THE regular Fall Quarterly Meeting of Council was held in Chicago, on October 21, with all members in attendance. A digest of the significant proceedings follows:

Announcement was made of the election of the Society as a constituent member of the *Engineers' Joint Council*, which has for its primary purpose the unifying of the engineering profession. The appointment of P. B. Gordon as our representative to *EJC*, with E. R. Queer as alternate, was confirmed. Present members include *ASCE, AIME, ASME, AWWA, AIEE, SNAME, ASEE, AIChE* and *ASRE*.

Upon the recommendation of the Membership Committee, 5 members were considered for Fellow Grade. Council approved a suggestion from the Executive Committee that henceforth the Honors and Awards Committee be responsible for processing nominations for Fellows and the election of Honorary Members.

Dates for the Semi-Annual Meeting in 1959, to be held at the Empress Hotel in Victoria, B.C., Canada, were set for June 7-11, and a preference was indicated for an eastern resort location for the June 1960 meeting.

The first ASHAE—Homer Addams graduate fellowship was announced as being granted to Paul Chung of the University of Minnesota with the award to be presented at the Annual Meeting.

Council approved a recommendation of the Guide Advisory Committee for a new format for the 1959 edition of THE GUIDE and a new rate for catalog data space.

The 1957 budget, prepared by the Finance Committee for the fiscal year November 1, 1956 to October 31, 1957, was approved.

During the Spring of 1956, each Chapters Regional Committee elected one member and a first and second alternate to serve on the Nominating Committee. Acting in accordance with Article VIII, Section 3 of the By-Laws, Council selected E. K. Cumming, Edmonton, Alta., B. L. Evans, St. Louis, Mo., J. D. Kroeker, Portland, Ore., and Reg. F. Taylor, Houston, Tex., to serve on the 1957 Nominating Committee, with G. C. F. Asker, Washington, D.C., and R. L. Stinard, New York, N.Y., alternates.

Guide Committee members appointed to commence editorial work on the 1958 Guide shortly after the first of November were confirmed to be: M. W. Keyes, chairman, Pittsburgh, Pa.; H. W. Alyea, Milwaukee, Wis.; W. P. Chapman, Pittsburgh, Pa.; R. C. Chewning, Portland, Ore.; J. Ray Duncan, New York, N.Y.; R. A. Gonzalez, Dayton, Ohio; N. B. Hutcheon, Ottawa, Ont.; R. L. Maher, Waterbury, Conn.; D. W. Nelson, Madison, Wis.

E. K. Stevens reported that nearly all available Exposition space had been sold and that unquestionably this 13th International Exposition would present the largest display of heating, ventilating and air-conditioning equipment ever assembled.

The Public Relations Committee outlined plans for the Society booth at the Exposition, which will feature a revolving central motif with educational display panels dealing with membership and publications, and a Research Laboratory demonstration unit.

The Standards Committee announced the appointment of a Committee to draft Minimum Ventilation Requirements for Air-Conditioned Spaces, with Albert Giannini as chairman, C. B. Gamble, R. A. Gonzalez, W. J. McConnell, M.D., R. J. Salinger and H. G. Strong. The fourth draft of the Standard for Comfort Air Conditioning is now being reviewed by committee personnel and by participating societies and associations.

A comprehensive long-range report on membership development was presented by the Membership Committee. Because much of the data included was thought to be of special value to each chapter, Council approved the reproduction of the report in sufficient quantity to permit distribution to every chapter officer.

Because of the popular acceptance of symposiums at recent Society Meetings, the Program and Papers Committee indicated that they would be continued with selected topics of timely interest.

In this and succeeding issues of our JOURNAL will be announcements of other important Council actions, but I hope this report will give the membership a brief resume of a portion of the proceedings.

As we approach the end of 1956, I would like to convey my personal regards to each member and extend sincere best wishes for the Holiday Season.

John W. James

President
AMERICAN SOCIETY OF HEATING
AND AIR-CONDITIONING ENGINEERS

Outlet Characteristics that Affect the Downthrow of Heated Air Jets

This paper is the result of research sponsored by the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, in cooperation with the Engineering Experiment Station of Kansas State College.

By Linn Helander*, S. M. Yen**, and Wilson Tripp***, Manhattan, Kans.

SUMMARY — Either or both of 2 effects, (1) an increase in the downthrow; and (2) an increase in the thermal spread of the jet, are shown, analytically, to be realizable by modifications in the design of a downward-discharge unit heater with an outlet of fixed diameter, if (1) the modifications increase the downthrust (projectile force) at the outlet or (2) they increase the product, $\beta_2 B_o$, formed by multiplying the buoyancy number, B_o, by the relative thrust, β_2. β_2 is defined as the actual thrust divided by the thrust calculated for zero gage-static pressure and a uniform velocity at the face of the outlet. Values of the thrust and β_2 developed by typical outlets are given, and data on the effects of cores and guide vanes on these values are presented. The data on β_2 have guidance value for estimating the thrust-developing capability of outlets of the types investigated. A simple means for measuring the thrust developed by an outlet is described.

Data obtained from research pursued at Kansas State College under the guidance of the TAC on Air Distribution and having guidance value for designers and application engineers are presented, herein, on the actual thrust (projectile force) and the relative thrust, β_2, developed by (1) a 4-in. *ASME* nozzle with a remote fan and (2) a unit heater with the fan immediately ahead of the outlet. The unit heater was equipped in one case with a deep cylindrical outlet, in the other, with a shallow diffuser. Data are presented also on the change in the actual and relative thrusts produced by:

1. First varying the vane angle, then removing the vanes with which the shallow diffuser was originally equipped.
2. Inserting short cores into each of the outlets with the downstream face of the core flush with the face of the outlet.
3. Placing a plate or shield in the jet at different distances downstream from the outlet.

The relative thrust, β_2, is defined as the ratio of the actual thrust developed by an outlet to the apparent thrust calculated for zero gage-static pressure and a uniform velocity, Q_o/A_o, across the face of the outlet. In the present instance, β_2 was evaluated by directly measuring the reactive force of an unheated, horizontal jet. For the *ASME* outlet, the values of β_2 so obtained are directly applicable when the outlet is used to produce a downwardly projected jet of heated air. For the other outlets so used, some correction to the values of β_2 obtained may prove necessary. Tests are planned to determine values of β_2 for heated, horizontally projected jets, and, to the extent observable, the effect on β_2 produced by using the equipment tested to develop downwardly projected heated jets. In the absence of such data, values of β_2 presented herein will be regarded as indicative of the values of β_2 for the equipment tested when this equipment is used to produce heated jets discharged vertically downward. This would seem to be justified, so long as this use of the equipment does not alter the delivery of the fan in cfm at its established speed.

An idealized theory of downwardly projected jets is reviewed briefly to show that if an outlet of given diameter is modified to increase the product, $\beta_2 B_o$, in which B_o is the buoyancy number (see Nomenclature), and offsetting forces are not developed at the boundaries of the space heated, the increase in $\beta_2 B_o$ will produce one or, to a lesser extent, both of the following effects:

1. An increase in the downthrow expressed in outlet diameters.
2. A° decrease in the magnitude of the radial temperature gradient and thus a radial expansion of the sensible thermal boundaries of the jet.

The same effects will be produced by an increase in the outlet downthrust. In either case, the effect or effects produced will depend upon the design of the outlet and the modifications made to it.

β_2 is shown to be one component of the factor, f, in the downthrow equation:[3]

$$L_{max}/D_o = 1.7 f B_o^{\frac{1}{4}}$$

Thus

$$1.7 f = [K_T(1+p)\beta_2]^{\frac{1}{4}}$$

where

K_T = a factor dependent on the pattern of temperature distribution in the room heated (K_T decreases as the magnitude of the radial temperature gradient decreases†.

p = the increment of vertical boundary forces (positive downward) due to dynamic effects induced by the jet, expressed as a fraction of the outlet thrust.

*Professor and Head, Department of Mechanical Engineering, Kansas State College. Member of ASHAE.

**Associate Professor, Department of Mechanical Engineering, Kansas State College.

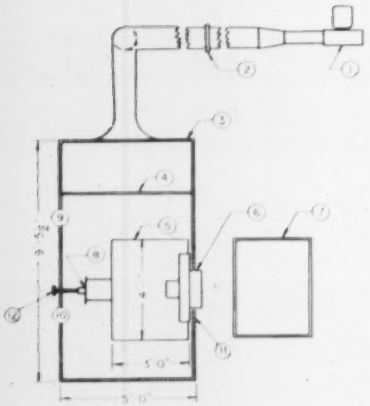
***Professor of Mechanical Engineering, Kansas State College.

For presentation at the 63rd Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Chicago, February 1957.

†Some other arrangement of empirical factors may prove preferable from the viewpoint of correlating experimental data. The arrangement adopted is convenient for present purposes.

β_3 = principally a function of the velocity profile and the average gage, static pressure at the face of the outlet. (Negative static pressures at the outlet decrease β_3; non-uniformities of local velocities at the outlet increase β_3).

Whirl at the outlet significantly reduced the magnitude of β_2. Thus

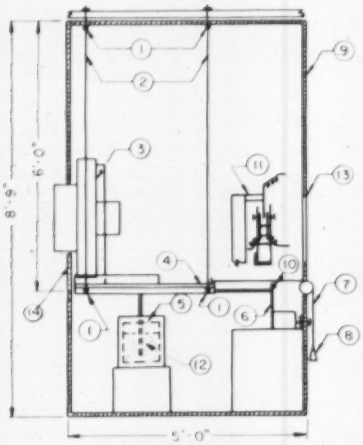


Reference numbers: (1) blower, (2) metering nozzle, (3) housing, (4) baffle, (5) swing platform, (6) unit heater mounted on swing platform, (7) instrument carriage, (8) thrust measuring device, (9) door, (10) window, (11) seal, and (12) means for restoring plumb position of swing platform. The door and window were closed and atmospheric pressure was maintained in the housing by means of the external fan (1).

Fig. 1—Dimensions and schematic arrangement of equipment (plan view) for measuring outlet thrust of unit heaters (to scale)

the average value of β_2 for the shallow diffuser and the cylindrical outlet, both without vanes or cores; and both served directly by the unit heater fan was 0.78, whereas β_2 for the whirl-free *ASME* outlet was 1.03. For the unit-heater, shallow-diffuser combination, vanes introduced into the diffuser and set vertical to the face of the outlet increased the magnitude of β_2 20 percent.

When cores were employed, an increase in the size of the core increased β_2 but reduced the rate of air delivery (the fans were operated at constant speed). Consequently, the thrust developed by an outlet first increased, then decreased as the core size was increased. The maximum thrust developed by the *ASME* nozzle and the vane-free shallow diffuser was realized when the ratio of the core area to the outlet area was between 0.3 and 0.5.‡ The corresponding rate of air delivery was 10 to 20 percent below the rate developed without cores. For the shallow diffuser with its original guide



Reference numbers: (1) ball bearings, (2) support rods, (3) unit heater, (4) swing platform, (5) vibration damper, (6) thrust-measuring beam, (7) string, and (8) calibration weights (not present when measuring thrust), (9) housing, (10) position-indicating switch, (11) enlarged top view of position-indicating switch, (12) vibration-damper oil, (13) window, and (14) seal.

Fig. 2—Dimensions and schematic arrangement of equipment, (side elevation) for measuring outlet thrust of unit heaters (to scale)

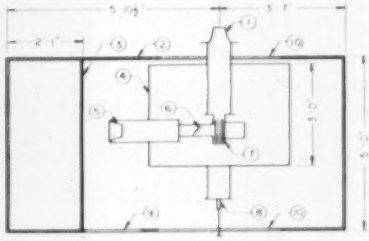
vanes, the maximum thrust and the maximum rate of air delivery were realized when the guide vanes were set perpendicular to the face of the outlet. Again the fan was run at one speed.

A 2-in. core inserted into the *ASME* nozzle had no significant effect on either the velocity or the shape of the velocity profile of the jet beyond a distance equal to 3 outlet diameters downstream from the outlet, although the volume rate of flow at the outlet was reduced 13 percent.

For an unrestricted flow rate of 4 cfs (240 cfm), the shield inserted into the jet from the 4-in. *ASME* nozzle had no significant effect on outlet conditions when placed more than one outlet diameter downstream from the outlet.

Equipment and Procedure

The thrust developed by an outlet was measured by mounting the outlet on a swing platform and measuring the reactive force of the jet pro-



The door (9) and the windows (10) were open so as to maintain atmospheric pressure in the housing. Reference numbers: (1) *ASME* nozzle, (2) housing, (3) baffle, (4) swing platform, (5) metering nozzle, (6) damper, (7) blower, (8) thrust-measuring device, (9) open door, (10) open windows.

Fig. 3—Dimensions and schematic arrangement of equipment (plan view) for measuring outlet thrust of *ASME* nozzle (to scale)

duced by the outlet. A photograph of the test station is shown in Fig. A-1 of the Appendix[11]. Plan and elevation views are shown schematically in Figs. 1 and 2. Fig. A-2 of the Ap-

‡For an outlet of fixed diameter, the maximum thrust occurs where $\beta_2 Q_0^2$ is a maximum.

‖It is planned to publish the Appendix with the paper in the 1957 TRANSACTIONS.

Table 1 — Outlet Flow Data for Unit Heater with (1) a Cylindrical Outlet and (2) a Shallow Diffuser, Both With and Without Cores and Without Vanes

Outlet	Core Used (6 in. diam.)	Q_o / $Q_{o_{nc}}$	τ_o / $\tau_{o_{nc}}$	β_2	C''_p	$\Delta\beta''_{3t}$	$(\Sigma f'^2)\cdot N$ / $(\Sigma f\cdot N)^2$
Cylindrical Outlet	Hemisphere	0.97	1.04	0.85	−0.35	0.055	1.59
Cylindrical Outlet	Disc	0.97	1.05	0.85	−0.34	0.054	1.61
Cylindrical Outlet	No Core	1.00	1.00	0.77			
Shallow Diffuser*	Hemisphere	0.97	1.08	0.89	−0.25	0.041	1.92
Shallow Diffuser*	Disc	0.98	1.07	0.87	−0.28	0.044	1.84
Shallow Diffuser*	No Core	1.00	1.00	0.79			1.55

$\frac{[(Q_o)\text{ shallow diffuser*}]_{\text{no core}}}{[(Q_o)\text{ cylindrical outlet}]_{\text{no core}}} = 1.05$; $\frac{[(\tau_o)\text{ shallow diffuser*}]_{\text{no core}}}{[(\tau_o)\text{ cylindrical outlet}]_{\text{no core}}} = 1.11$

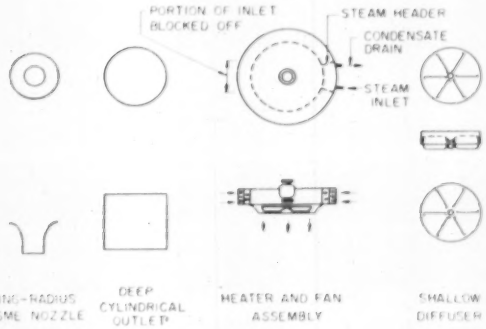
*Without guide vanes.

$C''_p = -(P_s - P''_{s1})/[(Q_o/(A_o - A_c))^2(\rho_o/g_c)\Delta\beta''_3]$ = $-C''_p\,[A_o A_c/(A_o - A_c)^2]$ = relative drag at downstream face of core; $[(\Sigma f'^2/N)]/[(\Sigma f/N)^2]$ = an index such that the larger its value the more non-uniform the velocity at the outlet; $[(Q_o)$ cylindrical outlet$]_{\text{no core}} = 27.5$ cfs (1650 cfm); $[(\tau_o)$ cylindrical outlet$]_{\text{no core}} = 0.60$ lb.

pendix is a photograph of the thrust-measuring device. This consisted of SR-4 type A5 strain gages mounted on a 6 × ½ × ⅛-in. vertical cantilever beam which was pressed against the swing platform (Fig. 2) so as to counterbalance the reaction of the jet and maintain the swing platform in a plumb position. Two lights connected to a position-indicating switch flickered at equal rates when the platform was in a plumb position (Fig. 2). The thrust-measuring device was calibrated by means of weights (Fig. 2). It was sensitive to a force of one gram applied to the swing platform as a simulated thrust. The manner in which the unit heater was mounted on the platform is shown in Fig 2. Fig. 3 shows the manner in which the *ASME* nozzle was mounted. Air at atmospheric pressure was delivered to the equipment on the swing platform in a direction at right angles to the axis of the outlet. The rate of flow of air to the outlets was regulated by dampers and measured by measuring nozzles (Figs. 1 and 3). The fan that served the *ASME* nozzle and the unit heater fan were each operated at a single speed.

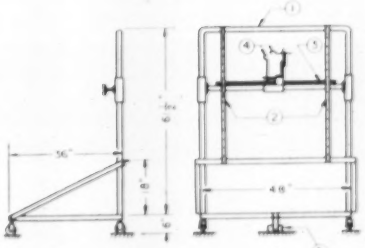
Fig. 4 shows the types of outlets employed. Fig. 5 shows the means employed for making velocity traverses at the outlet and in the jet downstream from the outlet. Various sizes and shapes of cores (Tables 1 and 2) were employed in the outlets without vanes. These cores were held in place by an external bracket attached to the outlet. Impact tubes used for determining the direction of flow of air at the face of the unit heater outlet are shown in Fig. 6. Velocities and static pressures were measured by means of impact and static-pressure tubes.

To check the accuracy of the thrust-measuring device, the thrust developed by the *ASME* nozzle was evaluated from the velocity profile and the result was compared with the measured thrust. The agreement was good.



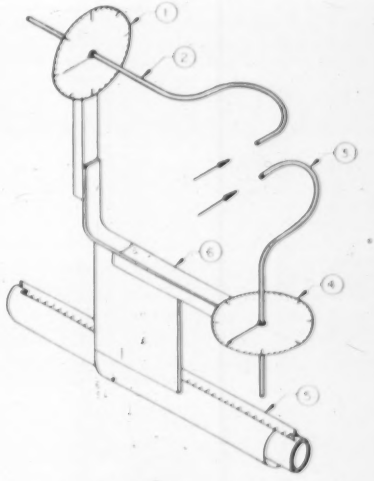
Dimensions of outlets: *ASME* nozzle, outlet diameter 4 in.; cylindrical outlet, diameter 17¾ in., length 13⅝ in.; shallow diffuser, diameter, 17⅛ in.

Fig. 4—Schematic drawings of long-radius *ASME* nozzle, heater and fan assembly, and outlets



Reference numbers: (1) carriage frame, (2) vertical scale, (3) horizontal scale, (4) impact tubes, (5) guide rail parallel to axis of outlet. The instrument carriage could be moved horizontally, *i.e.*, in the direction of flow. The impact tubes (4) could be moved in a vertical plane to any point within the frame (1) of the carriage.

Fig. 5—Dimensions and schematic arrangement of instrument carriage



Reference numbers: (1) vertical circular scale, (2) impact tube for velocity component in vertical plane, (3) impact tube for velocity component in horizontal plane, (4) horizontal circular scale, (5) horizontal scale, (6) frame.

Fig. 6—Schematic drawing of air-flow direction measuring device

Table 2—Outlet Flow Data for 4-in. *ASME* Nozzle With Wide Open Damper. Diam. of Core = 1¾ in.

$T_{o,\ no\ core} = 0.40\ lb$ $\quad Q_{o,\ no\ core} = 4.0\ cfs$

Core Shape	$\frac{Q_o}{Q_{o,\ no\ core}}$	$\frac{T_o}{T_{o,\ no\ core}}$	β_2	C'_p	$\Delta\beta'_2$
No Core	1.00	1.00	0.97	0	0
Core Bracket Attached					
Disc. Core	0.92	1.10	1.24	0.056	−0.069
Hemispherical Core*	0.96	1.10	1.16	0.001	−0.001
Conical Core* Flat Base	0.96	1.08	1.14	−0.006	0.007
Conical Core* Hemispherical Base	0.96	1.10	1.16	−0.009	0.011

*Pointed up stream

$\beta_2 = T_o/[(Q_o/A_o)^2\ (\rho_o/g_c)\ A_o]$; $C'_p = \overline{(P'_o - P_s)}/[(Q_o/(A_o - A_c))^2\ (\rho_o/g_c)$

$\Delta\beta'_2$ = drag at free area of outlet/$[(Q_o/A_o)^2\ (\rho_o/g_c)A_o]$

Idealized Theory

That the downthrust, T_o, and the product, $\beta_2 B_o$, have the properties attributed to them in the introduction can be established rather simply by a brief review of an idealized theory of downwardly projected heated jets. To do this, the following assumptions will be employed:

1. The outlet will be located at the ceiling of the room heated.

2. The resultant of all vertical forces, including the outlet downthrust, acting within and at the boundaries of the room heated by the jet will be zero.

3. The resultant of the buoyancy forces acting within the room can be evaluated as

$$(g/g_c)(L_{max})(\rho_a - \rho_{av})A_a$$

where

L_{max} = the throw, defined as the distance from the outlet to the level below which the jet produces no further sensible effect (the air below this level will be treated as still air at a uniform temperature, T_a).

A_a = cross-sectional area of the room heated.

ρ_a = density of a room-height column of air located where the air may be treated as still air at a uniform temperature, T_a.

ρ_{av} = average density of the volume of room air (average temperature, T_{av}) which extends down from the level of the outlet, L_{max} feet.

These assumptions lead to Equation 1 wherein the left-hand side is the buoyancy force:

$$(g/g_c)(L_{max} A_a \rho_{av})(T_{av} - T_a)/T_a = (\text{Outlet Thrust} + \Delta F_b) \quad \ldots\ldots(1)$$

where

ΔF_b = vertical resultant of dynamic forces at boundaries of room due to dynamic effects induced by the jet (positive acting downward on room air). Data on ΔF_b are not available; ΔF_b will vary with the geometry of the room.

Equation 1 takes the form of the downthrow equation previously presented[1]:

$$L_{max}/D_o = 1.7\,f\,\overline{B}_o^{1/2}$$

if

$$(L_{max} A_a \rho_{av})(T_{av} - T_a)/T_a = L^2_{max} D_o (\overline{T}_o - T_a)\rho_o/(K_T T_a) \quad \ldots(2)^*$$

$$\Delta F_b = (p)(\text{Outlet Thrust}) \quad \ldots\ldots(3)\square$$

$$(\text{Outlet Thrust} + \Delta F_b) = (1 + p)(\beta_2 U_o^2 \rho_o D_o^2/g_c) \quad \ldots(4)$$

*The form of Equation 2 is derivable analytically if the temperature point source is assumed to be at the outlet and if, *first*, $(T_c - T_a)/(\overline{T}_o - T_a) = L_p/L$ and, *second*,

$$(T - T_a)/(T_c - T_a) = e^{(-K'_T r^2/L^2)}$$

then $K_T = 2K'_T/(\pi L_p/D_o)$.

□Even with a fixed geometry of room, there is no present reason for expecting p to be a constant.

Thus, using Equations 2 and 3 in Equation 1:

$$(g/g_c)(L^2_{max})D_o(\overline{T}_o - T_a)\rho_o/(K_T T_a) = (1 + p)(\text{Outlet Thrust}) \quad \ldots\ldots(5)$$

Using Equations 2 and 4 in Equation 1 and solving for L_{max}/D_o:

$$L_{max}/D_o = [K_T(1 + p)\beta_2]^{1/2}\{\overline{U}_o^2/[gD_o(\overline{T}_o - T_a)/T_a]\}^{1/2} = [K_T(1 + p)\beta_2]^{1/2}\overline{B}_o^{1/2} \quad \ldots\ldots(6)$$

Equation 5 states that when T_a, D_o, and p are fixed, $L^2_{max}(\overline{T}_o - T_a)/K_T$ varies directly with the thrust. Equation 6 states that when D_o and p are fixed, L^2_{max}/K_T varies directly with the product, $\beta_2\overline{B}_o$.

K_T is a dimensionless factor that decreases when the thermal spread of the jet increases radially; that is when the rate of temperature reduction in a radial direction out from the axis decreases. It follows that an increase in the thrust or an increase in $\beta_2\overline{B}_o$ will, in the absence of offsetting boundary effects□, produce either or both of two effects: (1) An increase in the throw; (2) An increase in the thermal spread of the jet either as the consequence of a decrease in K_T or as a consequence of an increase in $(\overline{T}_o - T_a)/K_T$.

Equation 6 leads to the following expression for f:

$$f = [K_T(1 + p)\beta_2]^{1/2}/1.7 \quad \ldots\ldots(7)$$

Measured Values of β_2, the Outlet Flow Rate, Q_o and the Outlet Thrust, τ_o

The following equations were employed to correlate the measured values of β_2.

For the 4-in. long-radius *ASME* nozzle placed at the end of an 8-in. diameter duct:

$$\beta_2 = [\beta_{2,\,no\ core}]\{D^2_o/(D^2_o - D^2_c)\}\ \text{for}\ D_c/D_o < 0.8 \text{ and volume rates of flow within range covered in Fig. 7} \quad \ldots\ldots(8)$$

where

$\beta_{2,\,no\ core} = 1.03$.

D_o = outlet diameter.

D_c = core diameter.

For the shallow diffuser attached to the unit heater and operated with the guide vanes removed and with disc cores:

$$\beta_2 = [\beta_{2,\,no\ core}]\{D^2_o/(D^2_o - D^2_c)\}[1 - 0.37\,(D_c/D_o)^2]\ \text{for}\ D_c/D_o < 0.8 \quad \ldots(9)$$

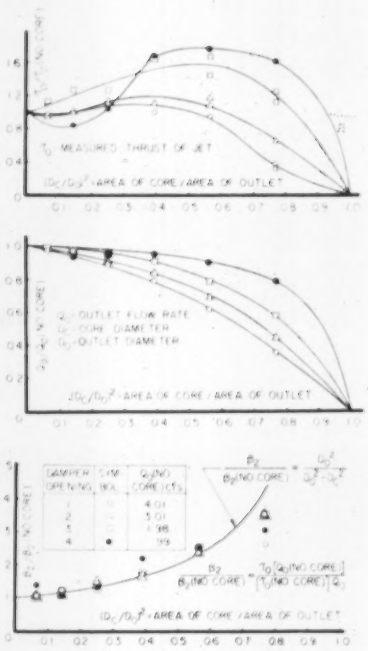
where

$\beta_{2,\,no\ core} = 0.8$.

For the shallow diffuser attached to the unit heater and operated with guide vanes turned to different angles, α, from their perpendicular position with respect to the face of the outlet, and without cores:

$\beta_2 = 0.97 + 0.012\,\alpha$, for α between 0 and 60 deg.

Plotted values of β_2, Q_o and τ_o for the foregoing cases are presented in Figs. 7, 8 and 9. The curves of τ_o and Q_o are specific only for the unit heater employed and, in the case of the *ASME* nozzle, only for the fan and damper openings used. Since the fans were operated at constant speed, τ_o had a maximum val-

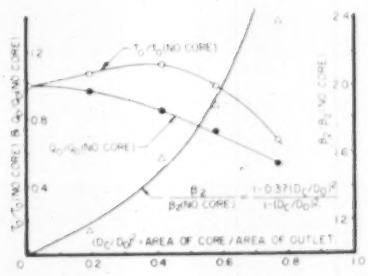

τ_o MEASURED THRUST OF JET
$(D_c/D_o)^2$ = AREA OF CORE / AREA OF OUTLET
Q_o = OUTLET FLOW RATE
D_c = CORE DIAMETER
D_o = OUTLET DIAMETER
DAMPER OPENING, INS.
Q_o (NO CORE), CFS
β_2 / β_2 (NO CORE) = Q_o^2 / Q_o^2 (NO CORE)
τ_o / τ_o (NO CORE) = $[Q_o^2/(NO\ CORE)]$ / $[Q_o^2(NO\ CORE)]$

Values of relative measured outlet thrust, τ_o, outlet flow rate, Q_o, and relative thrust β_2, expressed as ratio of corresponding values obtained when no core was employed and plotted vs. ratio of core diameter squared, D_c^2, to outlet diameter squared, D^2_o. Note that maximum measured thrust occurs at different points for different damper settings and falls between $(D_c/D_o)^2$ equal to 0.3 and $(D_c/D_o)^2$ equal to 0.5. D_c = diameter of core; D_o = diameter of outlet. $\tau_{o,\,no\ core}$ for damper openings 1 to 4, respectively: 0.40 lb, 0.22 lb, 0.09 lb, and 0.025 lb. The curves of τ_o and Q_o are specific only for the outlet, fan and damper settings employed. The fan was operated at constant speed.

Fig. 7—Outlet data for 4-in. *ASME* nozzle with disc cores

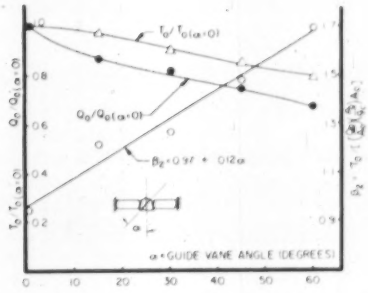
ue. This occurred, not where β_2 was largest, but where $\beta_2 Q_o^2$ was a maximum.

Table 1 gives data on β_2, Q_o and τ_o for both the straight cylindrical outlet and the shallow diffuser, each attached to the unit heater and equipped with (1) a 6-in. hemispherical core with the rounded face upstream, (2) a 6-in. disc core, and (3) no core. The values of β_2, in Table 1, average 0.78 for the cases wherein no core was employed and 0.88 for the cases wherein cores were employed.



Values of relative outlet thrust, β_2, outlet flow rate, Q_o, and measured thrust of jet, τ_o, expressed as ratios of corresponding values obtained when no core was employed are plotted vs. ratio of core area to outlet area, $(D_c/D_o)^2$.
β_2/β_2, no core $= [\tau_o/\tau_o$, no core$] \div [Q_o$, no core $/ Q_o]$
Note that maximum value of τ_o occurs when $(D_c/D_o)^2 = 0.4$. The curves are specific only for the unit heater and outlet employed. The fan was operated at constant speed.

Fig. 8—Outlet data for shallow diffuser without vanes and with disc cores



(1) Values of outlet flow rate, Q_o, and measured thrust of jet, τ_o, expressed as ratios of corresponding values obtained when $\alpha = 0$, and (2) values of β_2 vs. guide vane angle, α.
Q_o ($\alpha = o$) = 22.8 fps (1570 fpm); τ_o ($\alpha = o$) = 0.70 lb.

Fig. 9—Outlet data for shallow diffuser with guide vanes and without cores

Table 2 gives values of β_2, Q_o and τ_o for the 4-in. *ASME* nozzle equipped with cores having the various shapes shown in the table, and a diameter of 1¾ in. For the disc core, β_2 had a value of 1.24. For the hemispherical core, rounded face upstream, and the conical core pointed upstream, β_2 had an average value of 1.15. The value of 0.97 for the *ASME* nozzle without core is low by about 6 percent, due to the core-holding device attached to the outlet.

Drag Due to Negative Static Pressures at Outlet

Let P''_o be the average absolute pressure at the annulus of a cored outlet and P'''_o the average absolute pressure on the downstream side of the core. Then the drag, or negative contribution of P''_o to the projectile force of the jet, will be $(P_a - P''_o)(A_o - A_c)$ and that of P'''_o will be $(P_a - P'''_o)A_c$, where A_o is the area of the outlet and A_c the area of the core. When there is no core, P''_o becomes P_o and the drag becomes $(P_a - P_o)A_o$. For simplicity in correlating the data on P''_o and P'''_o, two terms were introduced:

$$C''_p = \frac{(P_a - P''_o)}{[(\rho_o/g_c)(Q_o/A_o - A_c)]^2} \quad \ldots\ldots(10)$$

$$C'''_p = \frac{(P_a - P'''_o)}{[(\rho_o/g_c)(Q_o/A_o - A_c)]^2} \quad \ldots\ldots(11)$$

If the momentum force of the jet divided by $(\rho_o/g_c)(Q_o/A_o)^2(A_o)$ is denoted as β_1, then:

$$\beta_2 = \beta_1 - \Delta\beta'_2 - \Delta\beta''_2 \quad \ldots\ldots(12)$$

where

$\Delta\beta'_2$ and $\Delta\beta''_2$ = the annulus and core-face drag components of β_2.

$$\Delta\beta'_2 = \frac{C'_p A_c}{(A_o - A_c)}.$$

$$\Delta\beta''_2 = \frac{C''_p A_o A_c}{(A_o - A_c)^2}.$$

Values of C'_p and $\Delta\beta'_2$ for the 4-in. *ASME* nozzle with 1¾-in. diam. cores were negligibly small. They are given in Table 2, based on P''_o extrapolated from the readings of 3 nozzle-wall pressure taps spaced 1 in., ½ in., and 1/16 in. from the face of the nozzle. Fig. 10 gives values of C''_p and $\Delta\beta''_2$ for disc cores placed in the outlet of the *ASME* nozzle. The curves plotted in Fig. 10 may be represented by:

$$C''_p = \frac{-0.24}{[1 - (D_c/D_o)^2]} - 1 \quad \ldots\ldots(13)$$

$$\Delta\beta''_2 = \frac{0.24}{[(D_o/D_c)^2 - 1]} \quad \ldots\ldots(14)$$

Fig. 11 gives values of C''_p and $\Delta\beta''_2$ for disc cores placed in the outlet of the unit heater equipped with the shallow diffuser with guide vanes removed. The curves plotted may be represented by the equations:

$$C''_p = \frac{-0.30}{[1 - (D_c/D_o)^2]} - 1 \quad \ldots\ldots(15)$$

$$\Delta\beta''_2 = \frac{0.30}{[(D_o/D_c)^2 - 1]} \quad \ldots\ldots(16)$$

For evaluating C''_p and $\Delta\beta''_2$, P'''_o on the downstream face of the disc cores was evaluated as the arithmetical mean of the average readings of

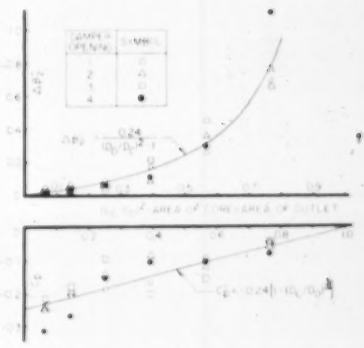


Fig. 10—*ASME* 4-in. nozzle: values of $\Delta\beta''_2$ and C''_p for disc cores vs. ratio, D_c^2/D_o^2 of core diameter squared to outlet diameter squared.

C''_p = $(P''_o - P_a)/[(\rho_o/g_c)[Q_o/(A_o - A_c)]^2]$

$\Delta\beta''_2$ = [drag at downstream face of core, lb]/$[(Q_o/A_o)^2(\rho_o/g_c)A_o]$

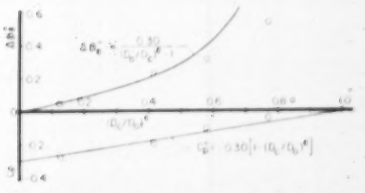


Fig. 11—Shallow diffuser without guide vanes: Values of $\Delta\beta''_2$ and C''_p vs. ratio D_c^2/D_o^2 of core diameter squared to outlet diameter squared.

C''_p = $(P''_o - P_a)/[(\rho_o/g_c)[Q_o/(A_o - A_c)]^2]$

$\Delta\beta''_2$ = [drag at downstream face of core, lb]/$[(Q_o/A_o)^2(\rho_o/g_c)A_o]$

The upper solid curve was derived from the bottom solid curve using the relation:

$\Delta\beta''_2 = C''_p A_c A_o/(A_o - A_c)^2$

four 0.056-in. I.D. pressure taps located at the corners of a 2-in. square centered on the disc.

Table 1 gives values of C''_p and $\Delta\beta_2''$ for the cylindrical outlet and shallow diffuser as employed, each equipped with (1) a 6-in. hemispherical core with the rounded face upstream and (2) a disc core. P''_o was evaluated as the arithmetical average

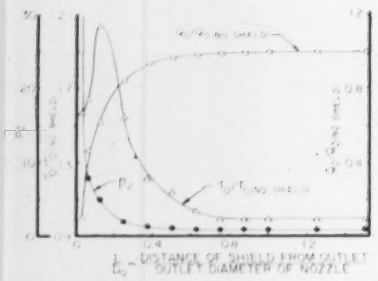


Fig. 12—*ASME* 4-in. nozzle: values of the outlet relative thrust, β_2, the measured outlet thrust, τ_o, and the outlet flow, Q_o, vs. the distance of shield, L/D_o, from the outlet when a 33-in. square shield was placed vertically in the jet. Shield had no effect on outlet conditions when L/D_o exceeded 1

of three 0.056-in. I.D. pressure taps located on the downstream face of the core 7/8 in., 1 11/16 in., and 2 23/32 in. from the center of the core.

Because of the uncertain accuracy of static pressure readings made in the presence of whirl, no attempt was made to measure P''_o, the average static pressure in the annulus, when dealing with nozzles attached to the unit heater.

The Quantity $[(\Sigma U^2)/N]/[(\Sigma U)/N]^2$ and Relative Momentum Flux, β_1

The quantity $[(\Sigma U^2)/N]/[(\Sigma U)/N]^2$ is an index of the degree of nonuniformity of velocity at the face of the outlet. The numerator in this quantity is the average of N (56, two in. apart) separately squared velocity readings at the outlet. The denominator is the square of the arithmetical average of the N readings. The quantity $[(\Sigma U^2)/N]/[(\Sigma U)/N]^2$ may be regarded as a rough approximation of β_1. Values of $[(\Sigma U^2)/N]/[(\Sigma U)/N]^2$ for the outlets attached to the unit heater appear in Table 1 and Fig. 13.

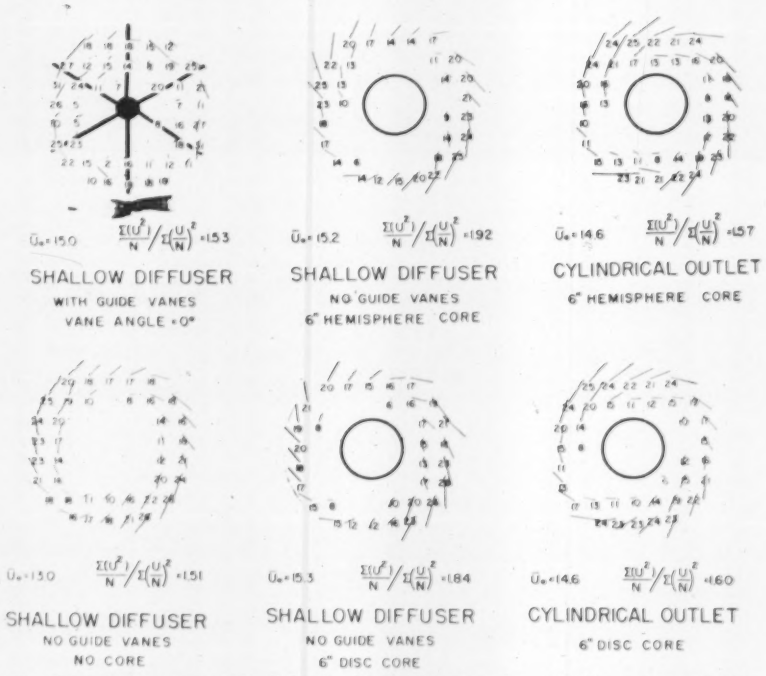


Fig. 13—Photographs of 3-dimensional models of outlet velocity vectors, looking into outlets. The number associated with each vector represents the magnitude of the vector. Practically all vectors point in the direction of clockwise rotation, indicating clockwise whirl. N = number of readings taken; U = local velocity at outlet; $\bar{U}_o$ = average velocity at outlet

β_1 for the *ASME* nozzle without core was 1.03. For the cored *ASME* outlets, β_1 was evaluated as $\beta_2 + \Delta\beta''_2$, $\Delta\beta'_2$ being negligible. This gave:

$$\beta_1 = [D_o^2/(D_o^2 - D_c^2)][1.03 + 0.24 (D_c/D_o)^2] \quad \ldots\ldots(17)$$

Effect of Jet's Impingement on Vertical Plate

Fig. 12 shows the effect on the outlet relative thrust, β_2, the outlet thrust, τ_o, and the outlet flow, Q_o, produced by a 33-in. square plate or shield placed vertically in the jet from the *ASME* nozzle at various distances, L/D_o, from the outlet. τ_o and Q_o are plotted as fractions of their respective values before the insertion of the shield. When the shield was more than one outlet diameter from the outlet, it had no significant effect upon outlet conditions. The flow rate before the shield was inserted into the jet was 4 cfs (240 cfm).

A study was made of the effect on the thrust produced by: (1) a 2-ft × 3-ft cardboard flange attached to and supported by the outlet flush with the outlet face, and (2) the same flange supported in the same position but free from contact with the nozzle. The effect of this flange was in both cases negligible.

Velocity Distribution at the Outlet

Fig. 13 is a pictorial representation of the pattern of velocity distribution at the outlet of the unit heater for each of 6 cases. In 4 of these, different modifications of the shallow diffuser were employed as the outlet. In the 2 remaining cases different modifications of the cylindrical outlet were employed. In preparing Fig. 13, a model was first made of the velocity distribution in each of the 6 cases, and then photo-

graphed. The model was 8 3/4 in. in diameter. Photographs were taken from a distance approximately 8 ft from the model. Velocities were represented in the model, both in magnitude and direction, by segments of 1/16-in. welding rod. The number in the figure associated with each segment gives the magnitude of the velocity to the nearest whole number. Velocities at the outlet were measured at 56 points spaced 2 in. apart.

mately 18 deg), nor on the shape of the velocity profile after the flow had reached a distance of about 3 outlet diameters from the outlet of the nozzle.

Fig. 15 shows the velocity profiles that were obtained with each of 4 different 1 3/4-in. cores placed in the *ASME* nozzle outlet. At 3 outlet diameters from the nozzle outlet, and beyond, the pattern of the velocity distribution was essentially the same

Nomenclature

A = area, square feet.
A_c = area of core, square feet = $\pi D_c^2/4$.
A_o = area of outlet, square feet.
A_s = cross-sectional area of heated space, square feet.
$\overline{B_o}$ = cross-stream average buoyancy number at outlet = $(\overline{U_o}^2/gD_o)/[(\overline{T_o}/T_s) - 1]$.
C'_p = $(\overline{P'_o} - P_s)/(\rho_o/g_c)\{Q_o/(A_o - A_c)\}^2$.
C''_p = $(\overline{P''_o} - P_s)/(\rho_o/g_c)\{Q_o/(A_o - A_c)\}^2$.
D_c = diameter of core, feet.
D_o = diameter of outlet, feet.
f = throw factor in equation for L_{max}/D_o.
ΔF_b = resultant of vertical forces generated by jet at the boundaries of the space heated (positive downward), pound.
g = 32.2 feet per (second) (second).
g_c = 32.2 (pound-mass) (feet) per (pound-force) (second) (second).
K_T = spacial temperature distribution factor.
K'_T = shape factor for temperature profile in equation:

$$(T - T_s)/(T_c - T_s) = e^{(-K'_T r^2/L^2)}.$$

L = distance from outlet along center line of nozzle projected, feet.
L_{max} = distance from outlet to bottom of jet.
L_0 = an empirical constant from the equation: $T_c - T_s/\overline{T_o} - T_s = L_0/L$.
N = number of velocity measuring stations at the outlet of the unit heater.
o = subscript referring to outlet.
p = $\Delta F_b/$(outlet downthrust).
P_s = atmospheric pressure, pounds per square foot, absolute.
$\overline{P_o}$ = average static pressure at outlet, pounds per square foot, absolute.
$\overline{P'_o}$ = average static pressure of the air stream at the outlet, pounds per square foot, absolute.
$\overline{P''_o}$ = average static pressure on downstream face of core, pounds per square foot, absolute.
Q_o = air flow at outlet, cubic feet per second.
r = radial distance from axis of jet, feet.
T_s = reference room temperature, Fahrenheit degrees, absolute.
T_{sv} = mass-mean temperature of air in heated space, Fahrenheit degrees, absolute.
T_c = Temperature on vertical axis of jet, Fahrenheit degrees, absolute.
$\overline{T_o}$ = mass-mean temperature at outlet, Fahrenheit degrees, absolute.
U = local velocity, feet per second.
$\overline{U_o}$ = cross-stream average velocity at the outlet, feet per second = Q_o/A_o.
a = guide-vane angle = angle between plane of blade and plane perpendicular to face of outlet.
β_1 = [outlet momentum force (flux)]/

$$\left(\frac{Q_o}{A_o}\right)^2\left(\frac{\rho_o}{g_c}\right)A_o = \frac{\int_{A_o}\frac{\rho_o U_o^2}{g_c}\,dA}{\left(\frac{Q_o}{A_o}\right)^2\left(\frac{\rho_o}{g_c}\right)A_o}.$$

β_2 = (measured thrust of jet)/$(Q_o/A_o)^2(\rho_o/g_c)A_o$ or $\{\rho_o\overline{U_o}^2 + g_c(\overline{P_o} - P_s)\}/\{\rho_o\overline{U_o}^2\}$.
$\Delta\beta'_2$ = (relative drag at free area of outlet)/β_2.
= (negative-pressure drag at free area of outlet/measured thrust) β_2.
$\Delta\beta''_2$ = (relative drag at downstream face of core)/β_2.
= (negative-pressure drag at downstream face of core/measured thrust)/β_2.
ρ_s = density of air corresponding to T_s, pounds per cubic foot.
ρ_o = mass density at outlet, pounds per cubic foot.
ρ_{sv} = average mass density of air in heated space, pounds per cubic foot.
τ_o = directly measured thrust, pounds force.

Velocities in the vicinity of the center of the outlet were in all cases zero.

Effect of Cores on Downstream Velocity Distribution

Fig. 14 shows the velocity distributions in the jet from the *ASME* nozzle at various distances from the outlet with and without a 2-in. disc core placed at the nozzle outlet. The air flow for the case in which the core was present was approximately 13 percent lower than the flow without the core. Within the accuracy of the instrumentation, the core had no effect on the total jet angle (approximately for the 4 cases. The jet angle for the 4 cores was between 18 and 19 deg.

Effect of Whirl

The following ratios will be employed:

(β_1/β_2) = (Momentum Force at Outlet)/(Measured Thrust) .....(18)

$(\Delta\beta'_2/\beta_2)$ = (Negative-Pressure Drag at Free Area of Outlet)/(Measured Thrust) .....(19)

$(\Delta\beta''_2/\beta_2)$ = (Negative-Pressure Drag at Downstream Face of Core)/(Measured Thrust) ....(20)

Journal Section

In the absence of deflecting devices, significant negative pressures will be present at the free area of an outlet only when produced by whirl, eddies, or other similar effects. For outlets without deflecting vanes,

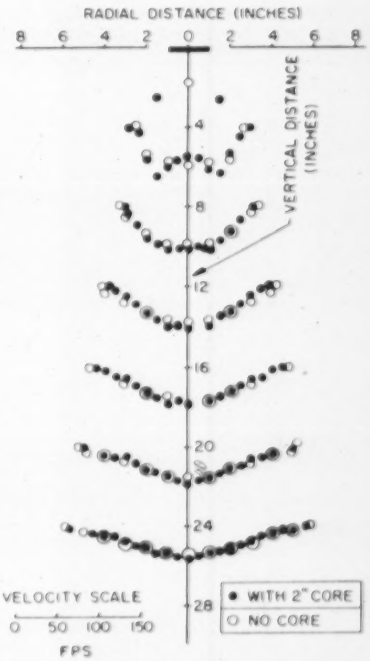


Fig. 14—Downstream velocity distribution in jet from 4-in. *ASME* nozzle, with and without a 2-in. disc core. Velocity at axis was slightly greater when the core was employed, but pattern of distribution downstream from outlet became similar for the 2 cases

$\Delta\beta'_2/\beta_2$ may be regarded, therefore, as the relative drag due to whirl.

The value of $\Delta\beta'_2/\beta_2$ for the *ASME* nozzle is zero. Values of $\Delta\beta'_2/\beta_2$ for the cylindrical outlet and the shallow diffuser evaluated from the data in Table 1 on the assumption that $\beta_1 = (\Sigma U^2/N)/(\Sigma U/N)^2$ are given in Table 3 together with corresponding values of β_1/β_2 and $\Delta\beta''_2/\beta_2$.

Values in Table 3 indicate that the drag effects due to whirl were equal to 80 to 100 percent of the net thrust or 40 to 50 percent of the momentum force of the jet.

The effect of whirl is furthermore demonstrated by the fact that both the core-free shallow diffuser and the core-free cylindrical outlet when attached to the unit heater and operated without guide vanes or any other device for checking whirl, developed values of β_2 substantially less than unity, namely 0.77 and 0.79. When vanes set perpendicular to the plane of the outlet were employed in the shallow diffuser, the value of β_2 increased from 0.79 to 0.97.

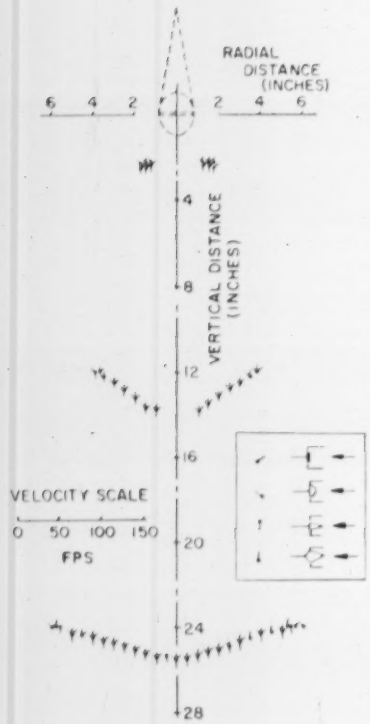


Fig. 15—Downstream velocity distributions in jet from the *ASME* 4-in. nozzle with 4 different types of 1¾-in. cores placed in outlet in the direction indicated by diagrams

Recapitulation

1. A simple means for measuring the thrust developed by an outlet and evaluating one component, $\beta_2^{1/2}$, of the throw factor, f, in the equation $L_{max}/D_o = 1.7 f \overline{B}_o^{1/2}$ have been presented together with typical data on these quantities.

2. Modifications to an outlet of fixed diameter which increase the product, $\beta_2 B_o$, have been shown to result in either a longer downthrow or a wider radial distribution of temperature effects, or in both effects each to a lesser extent, provided the increase in $\beta_2 B_o$ is not offset by boundary effects.

3. Whirl at the face of typical outlets created a substantial negative-pressure drag which resulted in values of thrust and β_2 well below the values that would have been realized in the absence of whirl. Guide vanes reduced whirl and thereby the drag.

It is suggested that the means described herein for evaluating outlet characteristics be given consideration by manufacturers of unit heaters. These means may be employed in local laboratories where space with high ceilings, such as is needed for full-scale tests, may not be available.

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2. ASHVE Research Report No. 1475—Maximum Downward Travel of Heated Jets from Standard Long Radius *ASME* Nozzles, by Linn Helander, Shee-Mang Yen, and R. E. Crank (ASHVE Transactions, Vol. 59, 1953, p. 241).

3. ASHVE Research Report No. 1511—Characteristics of Downward Jets of Heated Air from a Vertical Discharge Unit Heater, by Linn Helander, S. M. Yen, and L. B. Knee (ASHVE Transactions, Vol. 60, 1954, p. 359).

4. ASHAE Research Report No. 1562—Characteristics of Downward Jets from a Vertical Discharge Unit Heater, by S. M. Yen, Linn Helander, and L. B. Knee (ASHAE Transactions, Vol. 62, 1956, p. 123).

Table 3 — Tabulation of Beta Ratios

	(1) Momentum Flux ÷ Thrust = β_1/β_2	(2) Whirl Drag ÷ Thrust = $\Delta\beta''_1/\beta_2$	(3) Core Drag ÷ Thrust = $\Delta\beta''_2/\beta_2$	(4) Col. 2 ÷ Col. 1
Cylindrical Outlet 6 in. core no vanes	1.89	0.83	0.06	0.44
Shallow Diffuser 6 in. core no vanes	2.10	1.05	0.05	0.50
Shallow diffuser no core no vanes	1.92	0.92	0	0.48

Season's Greetings

To bring you every
Christmas cheer
and joy throughout
the coming year

John W. James
President

Radioactive Process Ventilation

By S. H. Glassmire* and J. P. Wahlen**, Los Alamos, N. M.

SUMMARY — This paper summarizes the unique requirements of laboratories handling radioactive materials. The Chemistry and Metallurgical Research (*CMR*) Building at the Los Alamos Scientific Laboratory of the Atomic Energy Commission is a typical example of a building incorporating these unusual design considerations. This is the first report to industry on the ventilation design and operational data of this building. The special features and details of the system are stated and shown diagrammatically.

Other ventilation considerations and problems of concern in the atomic energy industry, for example, ventilation of nuclear reactors, ventilation of ships and aircraft using nuclear fuel and ventilation of atomic bomb shelters, are briefly mentioned in order to give a complete picture of radioactive ventilation.

THE ADVENT of atomic energy brought forth a new industrial or occupational health hazard:—that of exposing man to the effects of ionizing radiation; that is, any radiation which is capable of producing ions when passing through matter. Working with radioactive material involves the possibility of exposing operating personnel to alpha, beta, gamma, and even neutron rays that are constantly emitted by radioactive substances. These rays may enter the body either externally by absorption through the skin or internally by inhalation or ingestion. Once they have entered the body, the effect of nuclear radiation is the destruction of various molecules that play an important part in the function of living cells.

Generally speaking, exposure to nuclear radiation is minimized in two ways: by shielding and by ventilation. *Shielding* is used to reduce exposure by radiation from an external source or one outside the body. Shielding is designed to reduce the higher energy gamma ray intensity to near zero at the human occupancy area. If gamma ray penetration is sufficiently reduced, the other lower energy or less penetrating, particles will be of no concern.

Proper *ventilation* is the prime precaution against internal exposure to radiation originating within the body. Dust in the working atmosphere surrounding nuclear activity has dangerous induced activity or particulate effluent of the nuclear material itself may contaminate the air. Once such radioactivity has been inhaled or ingested, it is in a position to do greater damage since it is closer to body tissue and subject only to depletion by decay or biological elimination processes.

There is no bodily sensation to indicate the presence of nuclear radiation and instruments must be used to determine where hazard exists. Since instrument warnings cannot be constantly located everywhere within the human occupancy areas, the ventilation must be proper and adequate at all times.

Buildings, laboratories, and enclosures containing or involving handling nuclear material within their confines obviously require unique and exacting ventilation, filtration, and air distribution considerations.

Ventilation Requirements of A Nuclear Laboratory

Requirements for various process laboratories may differ slightly. However, the following considerations may be set forth as pertinent and typical requirements for nuclear laboratories in general:

1. Adequate quantities of clean, treated, 100 percent fresh make-up air must be delivered to the laboratory areas. Air quantity requirements for contaminated human occupancy areas vary on individual jobs ranging from perhaps 10 to 90 complete air changes per hour. Much of the work on radioactive materials is analytical in nature requiring filtering and treating of the inlet air. The inlet air is 100 percent fresh since all exhaust, even though filtered, is potentially hazardous.

2. Adequate by-passes, crossovers, and auxiliaries must be provided so that failure or maintenance shutdown will not leave the laboratory without ventilation.

3. Exhaust air quantities must be sufficient to maintain adequate face capture velocities (100 to 250 fpm minimum average) across open faces of hoods and across equipment so as to assure carriage of contaminants away from operating personnel. (80 fpm is the absolute minimum at any one point.)

4. Exhaust duct velocities must be sufficient, generally 2000 to 5000 fpm, to suspend and carry heavy particulate contaminants to the filters.

5. Exhaust air filters must be:

a. Adaptable so that the collected particulate matter on used filters can be recovered.

b. Highly efficient on submicron particles.

CMR Building — Los Alamos Scientific Laboratory

General Remarks: The CMR Building is an example of a laboratory embodying these special considerations.

It is essentially a 3-story structure with a full attic and basement which are auxiliary to the main floor which contains the radioactive chemistry and metallurgical laboratory modules. It is a winged structure with 5 radioactive laboratory wings, each 267 ft long, branching off a 650 ft long spinal corridor. (See insert plan on Fig. 1.) Construction was completed in 1952 at a contract cost, excluding special equipment, of between 11 and 12 million dollars.

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For presentation at the 65rd Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Chicago, February 1957.

Journal Section

General Air Distribution and Flow Pattern: Fig. 1 is a cross-section of a typical wing showing the general flow pattern. It is interesting to note the proportional amount of auxiliary space which is subsidiary to the main operation modules shown in cross hatch. Air enters the building in the attic over the spinal corridor of each wing at positions marked *A* on the plan insert of Fig. 1. Air is exhausted at the ends of each wing at positions marked *B*.

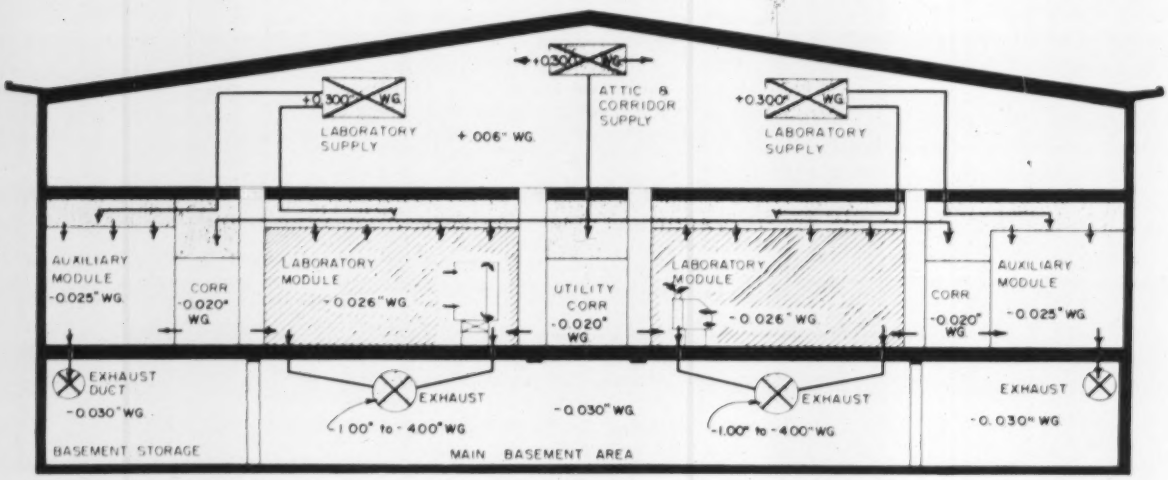
Supply air is distributed to various laboratories from mains in the attic to chambers above perforated metal ceilings in each module. The air is evenly distributed through perforations in the ceiling and is exhausted through equipment or by grilles at the floor into basement mains.

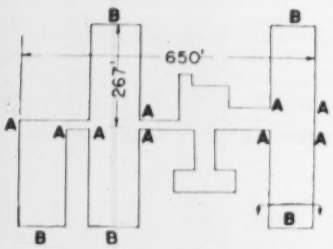
In general the air flow direction is from *cold* (least radioactive) to *hot* (more contaminated) areas. This flow pattern is maintained by carefully controlled static pressure regulators controlling the supply and exhaust to and from the various areas. The static pressure controllers, with sensing elements located in the main, regulate flow by automatic regulation of vortex type dampers. Fig. 1 shows the theoretical pressures maintained in the various areas in order to channel the flow in the proper direction from *hot* to *cold* areas. All pressures indicated are referred to atmosphere taken at 0.000 in. water. As can be seen, the static pressure gets less progressive (more negative) from cold to hot areas.

Each wing is currently handling approximately 80,000 cubic feet of air per minute or 400,000 cfm is handled by the whole building. Proper functioning of all ventilation equipment is constantly monitored in the Central Control Room (see Fig. 2). Any malfunctioning of any ventilation equipment will flash a red light on the panel which gives the location of the faulty equipment.

Supply System: The supply air for each wing is motivated by 3 *NAFM* No. *Q* radial bladed centrifugal fans with 25 hp motors. The 3 blowers discharge air into each of the 3 large supply mains in the attic (see Fig. 1) which essentially act as low pressure (+0.02 in. to +0.40 in. w.g.) plenums. From the mains the supply air is distributed via branches to chambers above the perforated ceilings in each laboratory module and corridor.

Each of the 3 supply systems in each wing draws 100 percent supply air from the atmosphere across screened louvers at an attic level 30 to 40 ft off the ground. The air is first drawn across oil impregnated wire roughing filters—thence across the preheat bank of steam heating





PLAN — CMR BUILDING
LOS ALAMOS SCIENTIFIC LABORATORY

Fig. 1 — Typical cross-section of wing. The general pattern of air flow is from the attic to the basement and on the operating floors from clean areas to potentially radioactive contaminated areas. Air enters the building through the attic and is exhausted from laboratories at the floor and is then carried to the air cleaning tower at the end of the wing. For interior pressures shown the atmospheric pressure outside of building is assumed at 0.000 in. water

coils set at 55 F—thence through the spray washer followed by moisture elimination plates—thence through the reheat coils set at 64 F—thence across a final set of oil impregnated wire filters—thence through the vortex damper through the blower into the attic mains.

Moisture pickup and thus relative humidity can and has been partially controlled by regulating the spray head pressure. This is done by modulating the valves of the spray headers according to the dictates of a humidistat located in the after spray chambers. Humidity can be partially controlled in this manner as long as the outside relative humidity is below the set level of the humidistat. This is true most of the time in Los Alamos with a mean relative humidity level of about 20 percent.

The spray water for the washers is recirculated. Build up of solid concentration is minimized by continuous blowdown at a rate equal to evaporation.

Supply amounts and main duct static pressure are automatically regulated by a vortex damper on the suction side of each supply blower controlled according to the dictates of the static pressure tip located in the duct. Branch duct supply to individual modules is regulated by hand-operated louver type dampers. Final heat to the individual modules is controlled by hot water booster coils in each branch duct regulated by thermostats in each module.

Exhaust System: The contaminated exhaust air from the main modules in each wing is exhausted by 2 *NAFM* No. *Q* backward curved centrifugal fans handling approximately 38,000 cfm each with 100 hp motors.

The exhaust mains are smooth round ducts running the length of each wing tapering from 18 to 48 in. diameter (see Fig. 3). They are constructed of 3/16-in. type 316 corrosion resistant stainless steel and are provided with automatic spray washers for additional protection against corrosive fumes.

Specially designed *horses* or *dogs* (see Figs. 4 and 5) act as branch ducts to supply the main. The legs of these horses draw air at the floor through grilles or through hoods or other laboratory equipment.

Desired flow through each leg is maintained by an orifice plate (see Fig. 4). Pressure drop across the orifice is measured and the quantity is then ascertained from curves plotted by actual cfm experimental values. None of the standard formulae for calculated *Q* are used. Each horse is equipped with a positive acting 16-in. wafer butterfly valve for additional branch flow adjustment (Fig. 4).

Static pressure in the main duct, which acts as a high velocity header, is maintained at a desired constant by an automatic vortex damper on the suction side of each exhaust fan. The damper regulates according to the dictates of a static pressure tip located in the exhaust mains.

Static regain does not play a great part in the overall system which is contrary to what might be expected. Changes in duct velocities are purposely kept small so as to keep the conveying capacity satisfactory. In fact, regain is sacrificed by utilizing converging stacks to give a greater throw and dispersion into the atmosphere.

Exhaust Air Filters: All discharge air from laboratories handling radioactive materials must be considered as contaminated and must be filtered to low tolerance levels before release

to the atmosphere. Just how clean the discharge effluent must be is as yet unanswered.

Type of air filtration varies according to the nature of the radioactive contaminants. Many different types of air cleaning equipment are and have been used in the AEC industry. These include:

A. Settling chambers
B. Centrifugal separators
   1. cyclones
   2. baffle chambers
   3. Venturis
C. Wet filters
   1. air washers and spray towers
   2. wet cells (capillaries)
   3. combinations of 1 and 2
D. Electrostatic precipitators
E. Impactors
F. Dry filters
   1. viscous impregment filters
   2. dry filters
   3. high efficiency filters

The most satisfactory results are obtained by using a combination of some of these collectors in series. Various kinds of filters are arranged in order of increasing efficiency with roughing filters preceding the ones of greater efficiency.

Replacement or cleaning filters obviously involves exposure to radiation and poses a special problem.

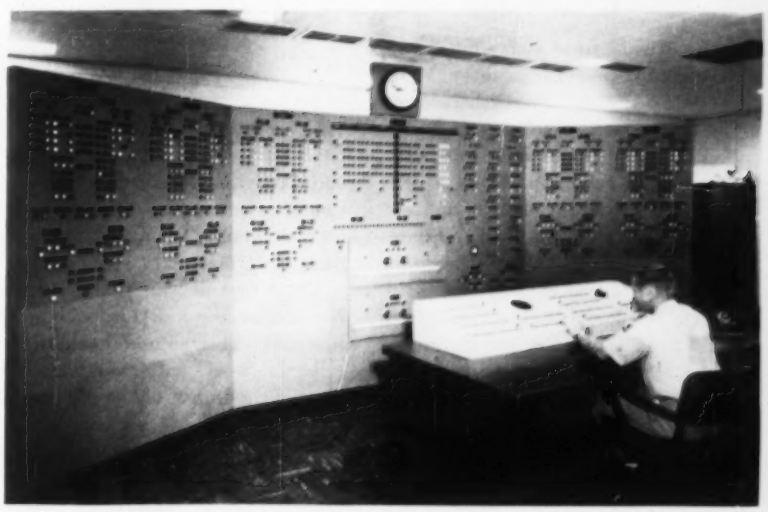


Fig. 2 — View of central board with lights for each piece of ventilation equipment

The particulate matter collected on used filters often times is valuable and must be recovered. Both the collecting media and the form that the filters are in must lend themselves to recovery operations.

In the CMR Building the particulate contaminants discharged into the exhaust air stream are, for the most part, irregularly shaped, heavy metallics. Particle size varies but most of the contaminants are in the submicron range.

The exhaust from each wing enters the filter tower and goes through the so-called capillary air washers first. These are essentially banks of 20 in. × 20 in. × 8 in. thick cells with coarse glass (about 0.01 in. diam.) filaments set at an angle to the air stream. Water from spray heads, oriented in the direction of the air stream, is sprayed over the cells and water cascades over the entire cell bank. Such capillaries are highly efficient removers of corrosive fumes, acid mist, and chemical vapors. This is one of their prime functions. Their efficiency on submicron particulate matter has never been ascertained at this installation since no samples are taken directly behind them. *Zig-Zag* water eliminator plates follow the capillaries to protect the downstream dry-filter pads against water saturation.

Next in the series of filters is the first bank of dry filters utilizing glass fiber media depending upon density and roughing efficiency desired. Coarse spun glass pads are often used depending upon the size of the particulate matter.

These first dry filters are followed by another wet cell identical to the first one. This second bank of wet cells is used only under certain process conditions of the effluent.

Final cleanup is accomplished by commercial glass fiber mat filters or by specially compacted spun glass pads of varying density manufactured to Laboratory specifications.

Using various combinations of these media in the series of 5 filters (3 wet and 2 dry), overall efficiencies in excess of 99 percent are maintained.

Local filtering is employed at the source of exceptional *hot spots*. Efficiencies checked under actual operating conditions run about 99.99 overall and 99.95 for particles smaller than 0.25 microns. (All efficiencies are measured by drawing off equal air samples at the same rate before and after the filters. The air is drawn across millipore media which are counted for total radioactivity. The inlet and outlet are then compared.) Local filtering at the source of known hot spots avoids undue contamination of the central filtration units.

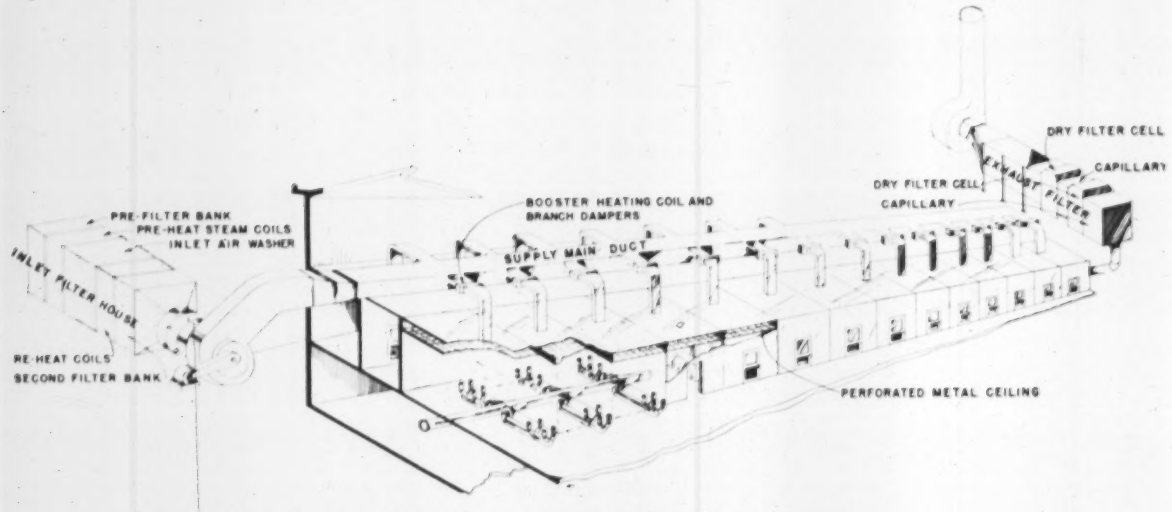


Fig. 3 — Pictorial section of half of typical wing showing ventilation system

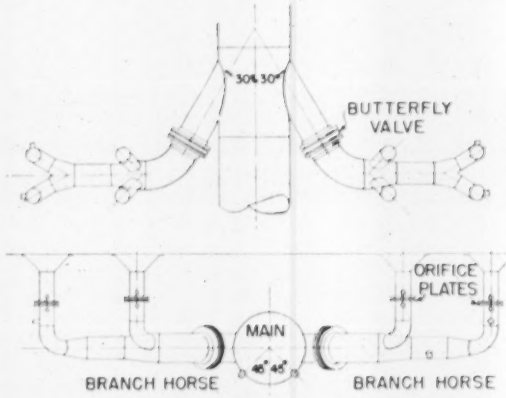


Fig. 4 — Specially designed horses or dogs which act as branch ducts to supply exhaust mains. Note presence of orifice plates and butterfly valves to regulate flow in each branch

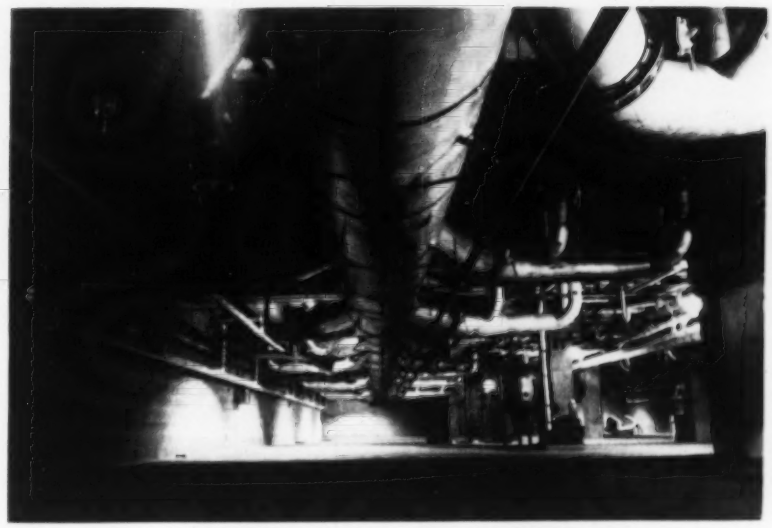


Fig. 5 — View of exhaust main and branches in a typical wing.

Radioactive *hot* cells always employ local exhaust filtering right at the wall of the cell. Cells are essentially rooms or chambers with excessive radioactivity and generally require walls of cement or other material several feet thick to shield gamma radiation. High air flow through such enclosures is generally desired. Exhaust filtering is generally performed at the walls or the floor of the cell. The filtering media must serve a most difficult dual capacity as a shield and a high efficiency particulate filter or shielding must be built around the hole. At Los Alamos we have experimented with a type of sand filter for such purposes. Volcanic tuff, a highly vesicular consolidated volcanic ash, is ground to size of 1 in. down to 50 mesh. A thick bed of such material acts as a good gamma radiation shield. Experimental tests give overall efficiencies over 99 percent at about 1 in. water pressure drop. (See Fig. 6.)

Other Nuclear Ventilation Applications

Reactors: Most reactors to date are experimental types which must waste heat, nuclear phenomenon being of first interest. In order to maintain high neutron flux levels, the associated thermal energy must be dissipated lest the reactor temperature exceed the materials' melting points.

The most common coolant is air, whose low specific heat makes the quantities involved very great. A reasonable figure for air flows is 25 cfm per kilowatt. The inlet air must be filtered by *highly efficient filters* to remove the likelihood of atmospheric dusts becoming radioactive by neutron bombardment. The exit air must be absolutely filtered, also, to remove radioactive dusts originating from within the core. As a rule, the coolant air passes through small diameter, long passages, integral with the reactor. The friction loss is large

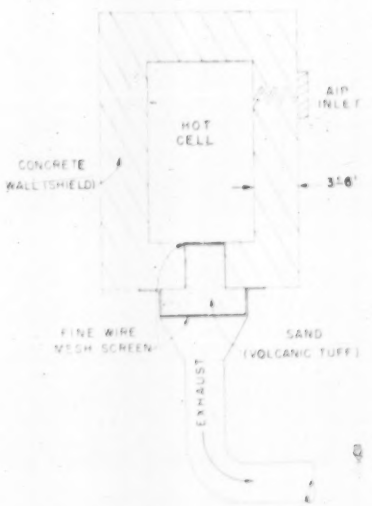


Fig. 6 — Diagram showing hot cell where highly radioactive material is present with sand filter in exhaust under floor

and the temperature of the exhaust air is quite high, around 300 F. At Brookhaven, the air is discharged through 320-ft stacks and requires enormous fan horsepowers.

Power Engines: Since power plant reactors have the purpose of being heat sources, air cooling should not be used. Other media will transfer the thermal energy to the heat exchanger. Ventilation requirements will be for reducing health hazard to operating personnel and not for controlling reactor temperatures.

Power engines for ship or aircraft using nuclear fuel propulsion utilize the heat and discharge the exhaust. Dispersion and dilution by the atmosphere or the sea is currently the only safeguard against contaminants contained in the exhaust. Protection for the crew is maintained by progressively greater negative pressures assuring flow direction from cold to progressively more contaminated zones.

Nuclear Bomb Shelters: Nuclear weapons have and will necessitate the need for shelters that afford protection against radioactive fallout. This involves a ventilation problem—again utilizing high efficiency filters with blowers and motors sufficient to pull their required pressure drop.

Conclusion

The advent of atomic energy has brought forth new problems to confront the ventilation engineer. Such problems to date have been mainly limited to classified government installations. However, with commercial and peacetime utilization of atomic energy now becoming a reality, the problems and special considerations will be general with industry.

Acknowledgment

The illustrations used in the paper are the work of Joyce B. Engle to whom the authors express grateful acknowledgment.

AIR DISTRIBUTION

By W. O. Huebner*, New York, N. Y.

Proper air distribution is of decisive importance in comfort air conditioning systems. This was early recognized by the Society, and research on air distribution has been a significant Society activity for many years.

The scope authorized for the Technical Advisory Committee on Air Distribution is *the investigation of problems in fluid mechanics related to the flow of air in confined and open spaces.* Consequently, the TAC deals mainly with the basic problems of air transmission through ducts and air distribution in rooms.

Research Accomplished

Research at the ASHAE Laboratory, Case Institute of Technology, Kansas State College, Michigan State University, and other institutions, has signally contributed to increase knowledge on friction in straight ducts and duct fittings; on the behavior of free air streams, isothermal and non-isothermal ventilating jets, heated air jets; and on outlet performance generally.

Research at Case Institute of Technology and Kansas State College is continuing at present, and papers will be presented at the 1957 meetings of the Society. In addition, Case Institute of Technology is preparing a Research Bulletin on Air Distribution, which will summarize the present state of theory, experimentation and application of data on air jets and room air distribution.

Material for THE GUIDE

Each year the TAC reviews those sections of THE GUIDE which pertain to its scope of activity, *viz:* the chapter on Air Distribution and the chapter on Air Duct Design. A permanent subcommittee carries out this assignment.

For THE GUIDE 1956, the subcommittee rewrote the chapter on Air Duct Design almost in its entirety to assist the user in designing good duct systems. During 1956, the subcommittee on High Velocity Systems (Chairman L. R. Phillips) and on Duct Construction (Chairman R. O. McGary), have prepared a new section on High-Velocity Systems and new tables on duct construction for aluminum sheet metal and high pressure rectangular ducts.

The subcommittee on High Velocity Systems was established some time ago in recognition of the need for sufficient information on the design of these systems. Preparation of new material for THE GUIDE was the first important assignment of the subcommittee.

Possible Future Research Projects

At present, the committee is studying possible future research projects, which will provide useful data on the special problems of high velocity systems. Other research projects in the long-range program of the TAC are the theory of air flow, pressure losses in flexible ducts, friction loss in take-off fittings, heat gain to and loss from air ducts, use of the electrical analogue in air distribution problems, and residual velocities from ceiling and high wall outlets.

Most of these problems are now being investigated by members of the TAC acting as one-man review committees, and it is expected that some of them, which call for neither complicated test set-ups nor for heavy financial expenditures, will start in the near future.

Desirable as these projects are, the members of the TAC always keep in mind that the Society's reputation rests primarily on its contributions to basic research. Therefore, the TAC, in its long-range research planning, gives proper emphasis to truly fundamental investigation of the problems of air movement in enclosed and open spaces. For this reason, a special subcommittee on the Theory of Air Flow (Linn Helander, Alfred Koestel and H. B. Nottage) is now appraising past work and investigating future research projects. Closely related to the program of this subcommittee is the work of another subcommittee (Chairman S. F. Gilman), which is studying a research project proposal, dealing basically with the parameters which influence the residual velocities in the occupancy zone of a room served by conventional ceiling or high wall outlets.

The growing importance of air conditioning and its general acceptance calls for further improvement in the design of the air distribution systems, which are the only parts of the equipment with which the occupant of a room actually comes in contact. Members of the TAC on Air Distribution invite the cooperation of each member of the Society in furthering this aim.

*Chairman, ASHAE Technical Advisory Committee on Air Distribution.

Anderson Medal to Professor Fahnestock

The 15th Award of the F. Paul Anderson Medal has been made to Prof. M. K. Fahnestock, Urbana, Ill. In accordance with established custom, the presentation of the medal to Professor Fahnestock will be made by Pres. John W. James at the Annual Banquet at the coming 63rd Annual Meeting in Chicago on February 25-28, 1957.

Professor Fahnestock has made outstanding contributions over a period of years. As a result of his many research projects, he has prepared or co-authored more than 20 papers in Society publications, as well as numerous papers for other publications. His contributions have covered not only studies of heating methods and equipment, but he has long been interested in physiological aspects of air conditioning.

At present, Professor Fahnestock is research professor of mechanical engineering and chairman, Physical Environment Unit at the University of Illinois. During the 30 years that he has been connected with the University, Professor Fahnestock has advanced steadily from research assistant in 1926 to research professor of mechanical engineering and assistant director of the Engineering Experiment Station in 1942. In 1949, he was appointed engineering director of the Physical Environment Unit. He has held his present position since 1953.

Professor Fahnestock's research studies were first directed toward heating and air-conditioning problems, but in recent years, he has given increasing attention to the development of the Physical Environment Unit which includes special facilities for studies on the physiological effects of atmospheric environment on people, agricultural animals and plants. He has also performed important liaison work between the University's Colleges of Medicine, Agriculture, Liberal Arts and Sciences, and Engineering in the development of extensive research and research facilities in environmental physiology in relation to the comfort and health of people and the productivity of agricultural animals and plants. The University has pioneered in getting physicians, physiologists, psychologists, etc. and engineers to work together on problems involving people, animals and plants.

Professor Fahnestock is a long-time member of the Society (elected a Junior in 1927). He has taken a great interest in many phases of the Society's work and was a member of Council during 1952, 1953 and 1954. Other Society positions which he has held include: Committee on

Research, 1938-43 and 1947-50; its Research Executive Committee, 1940-43; chairman, TAC on Refrigeration in Relation to Air Treatment, 1935-36; chairman, TAC on Direct and Indirect Radiation with Gravity Air-Circulation, 1935-36; member TAC on Effect of Entering Temperature and Velocity on Temperature and Distribution of Air within an Enclosure, 1936; chairman, TAC on Radiation with Gravity Circulation, 1937-43; member, TAC on Air Distribution and Air Friction, 1938-39 and 1943; chairman, TAC on Summer Air Conditioning for Residences, 1937-43; member, TAC on Instruments, 1939-40; TAC on Sensations of Comfort, 1945-47 and 1950-56; and chairman, TAC on Physiological Research, 1950-56. He has also been a member-at-large of the Joint Committee for Revision of Codes for Minimum Requirements for Comfort Air Conditioning from 1952-56. He also served as a member of the Public Relations Committee during 1954.

In addition to being a member of the Society, Professor Fahnestock is also a member of the *ASRE* and the *ASEE*.

The award of the F. Paul Anderson Medal is made possible through a gift to the Society by the late Thornton Lewis of Philadelphia, Pa., who was President of the Society in 1929. Dean F. Paul Anderson of the University of Kentucky, for whom the award was named, was President in 1927.

Members of the 1956 F. Paul Anderson Award Committee are P. B. Gordon, New York, chairman; Albert Buenger, Boston; W. L. Fleisher, New York; L. N. Hunter, Johnstown; and A. J. Nesbitt, Philadelphia.

ASRE MEETS IN BOSTON

The *American Society of Refrigerating Engineers* held its 43rd Semi-Annual Meeting at the Statler Hotel in Boston on November 26-28. The program included 4 technical sessions with 12 papers as well as several conferences including an air-conditioning conference and 6 forums. Serving as official representative of the Society at the meeting was Pres. John W. James, Chicago, Ill.

CENSUS DATA ON WHOLESALE TRADE

A preliminary trade report on the 1954 Census of Business and covering the wholesale distribution of heating and plumbing equipment is available from the Bureau of the Census, Washington, D. C., at 10 cents a copy. It includes census figures covering both heating and plumbing distributors giving the figures separately for each. The census data come from some 905 heating distributors.

HEMEON ON FRANKLIN INSTITUTE PROGRAM

On October 15, the Franklin Institute in Philadelphia sponsored a one-day symposium on *Cleaner Air for Urban Areas*. Among the speakers was W. C. L. Hemeon, member of ASHAE. Dr. Hemeon is currently serving on the TAC on Air Cleaning and the TAC on Industrial Environment. In May, Dr. Hemeon organized the Hemeon Associates with offices in Pittsburgh to provide a consulting service for all scientific aspects of air pollution.

It's Chicago in '57 for the 63rd Annual Meeting

Chicago in February is the place for all Society members. Many have already indicated that they will be present for the 63rd Annual Meeting and 13th International Heating and Air-Conditioning Exposition, February 25-March 1, 1957.

The Conrad Hilton is headquarters for registration, technical sessions and most of the special events.

P. J. MARSCHALL
General Chairman

H. M. HART
Honorary Chairman

Registration begins at 10:00 a.m., Sunday, February 24, continuing through Thursday, February 28.

The Annual Meeting is the main event of the Society year. It is at this time that newly elected officers are installed, members elected to the Council and Committee on Research take their places, committee meetings are held and the entire mechanism of the Society moves into high gear in anticipation of another year of successful activity.

Notwithstanding the interest in committee meetings and contemplated activities and projects for 1957, members in attendance also will look forward to six sessions which include 13 papers and 2 symposiums carefully selected to retain the attention of everyone in the profession.

When not preoccupied with sessions or meetings, members may visit the Exposition, which runs concurrently in the International Amphitheatre. With 96 percent of available exhibit space sold and 475 exhibitors already enrolled, applications for space continue to swell the roster of this greatest display ever projected by a single industry. A larger number of exhibitors have contracted for a greater amount of floor space than at any similar display. Floor space for the Exposition has been increased 15 percent over the size originally anticipated for this record-breaking show. The Exposition will open Monday, February 25, at 2:00 p.m. and close on Friday, March 1, at 6:00 p.m. During the week the Exposition will open at noon every day except Monday and close at 10:00 p.m. every night except Friday. Special daily round-trip bus transportation will be available. Beginning at 11:00 a.m. (12:00 p.m. on Monday) buses will run at 30-minute intervals starting from the Clark St. entrance to the Sherman Hotel and making the following stops: Clark St. entrance, Morrison Hotel; Monroe St. entrance, Palmer House; Michigan Ave. entrance, Congress Hotel; and 8th St. entrance, the Conrad Hilton.

H. G. GRAGG
Vice Chairman

A. C. WILLARD
Honorary Chairman

S. R. LEWIS
Honorary Chairman

Then, too, there is the lighter side as provided by various special events contemplated by the Illinois Chapter Committee on Arrangements under the general chairman, P. J. Marschall, and vice chairman, H. G. Gragg, Illinois Chapter president. Honorary chairmen are Society Past Presidents H. M. Hart, S. R. Lewis and A. C. Willard.

As of now, plans include a reception on Sunday afternoon, a Monday welcome luncheon at noon, an en-

E. P. HECKEL, JR.
Chairman, Finance

H. J. COUCH
Chairman, Facilities

L. O. PAUL
Chairman, Sessions

R. W. ROOSE
Publicity Chairman

G. G. FREYDER
Reservations Chairman

W. G. PENNINGTON
Exposition Co-Chairman

L. H. STREB
Get-Together Co-Chairman

G. V. ZINTEL
Banquet Co-Chairman

tertaining get-together party in the evening, and the Annual Banquet on Wednesday evening.

In addition the ladies will have their own program of pleasant engagements including a style show and sightseeing.

With all of this to take up one's time, should there be an opportunity to look around Chicago, there is

C. M. BURNAM, JR.
Luncheon Co-Chairman

HERBERT KREISMAN
Hospitality Chairman

M. W. BISHOP
Reception Co-Chairman

R. J. SALINGER
Registration Co-Chairman

J. C. SCOTT
Inspection Trips Co-Chairman

much to see. For example the Chicago Historical Society, containing one of the finest historical collections in America, or Lincoln Park Zoo housing 2,600 mammals, birds and reptiles.

Pres. John W. James will open the 63rd Annual Meeting at 9:30 a.m., Monday, February 25.

Among the papers to be presented, such subjects will be offered as panel heating, heat pump underground coil design, cooling tower packings, solving thermal circuits by analogue computer, outside design temperatures in the United States, air cleaning, and the characteristics of air jets.

MRS. H. G. GRAGG
Ladies' Co-Chairman

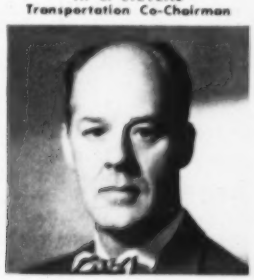
The third session, scheduled for Tuesday morning, February 26, consists of a symposium on dehumidification, moderated by John Everetts, Jr. The members of the panel and their subjects are: W. E. Ellis, *Dehumidification by Refrigeration*; W. L. Ross, *Dehumidification by Solid Sorbents*; E. W. Gifford, *Dehumidification by Liquid Sorbents*; G. A. Higgs, *Economics of Dehumidification as Related to Storage*; and E. R. Queer, *Typical Problems and Their Solution*.

Likewise on Wednesday morning, February 27, the fifth session also is a symposium. Moderated by C. H. Pesterfield, the subject is *Industrial Ventilation*. Panel members and their subjects are: P. J. Marschall, *Control of Industrial Environment*; K. E. Robinson, *Local and General Atmospheric Contaminants Control*; J. M. Kane, *Cleaning Industrial Effluent*; B. R. Small, *Summer-Winter Comfort Ventilation for Industry*; and W. C. L. Hemeon, *The Inertia of Dust Particles and Various Consequences*.

Certainly this brief glimpse of the week of February 25, 1957 should arouse in each and every member a strong desire to make hotel reservations immediately.

J. S. KEARNEY
Entertainment Chairman

H. C. STEVENS
Transportation Co-Chairman



H. E. ANDERSON
Orchestra, Acts Co-Chairman

E. R. TESKE
Information Co-Chairman

PROGRAM — 63rd Annual Meeting — CHICAGO

The Conrad Hilton Hotel **February 25-28, 1957**

(Registration, all Technical Sessions, and Meetings at The Conrad Hilton Hotel unless otherwise designated)

Saturday — February 23

10:00 a.m. Executive Committee, P. B. Gordon, *Chairman*

2:00 p.m. Finance Committee, A. J. Hess, *Chairman*

Sunday — February 24

10:00 a.m. REGISTRATION (*Beverly Room*)

10:00 a.m. Council Meeting (*Lamb & Mint Room — Stock Yards Inn*)

10:00 a.m. Committee on Research

3:00 p.m. Reception and Refreshments with an Hawaiian accent

Monday — February 25

9:00 a.m. REGISTRATION (*Normandy Lounge*)

9:30 a.m. FIRST SESSION (*Waldorf Room*)

Call to Order — Pres. John W. James

Greetings by P. J. Marschall, Chairman Committee on Arrangements

Report of President — John W. James

Report of Council — A. V. Hutchinson

Report of Treasurer — R. A. Sherman

Study of Three Redwood Cooling Tower Packings, by W. W. Smith

Earth as Heat Source and Sink for Heat Pumps, by D. M. Vestal, Jr. and B. J. Fluker

From '36 to '56: Air Conditioning Comes of Age, by W. A. Grant

12:00 noon WELCOME LUNCHEON (*Grand Ballroom*)

Toastmaster: C. M. Burnam, Jr.

Speaker: Dr. Richard Heflebower, Chairman, Economics Dept., Northwestern University

2:00 p.m. EXPOSITION — Opening of 13th International Heating and Air Conditioning Exposition (*International Amphitheatre*). ASHAE Booth 701.

2:30 p.m. Ladies Talent and Tea (*Crystal Ballroom*, Sheraton Blackstone Hotel)

9:00 p.m. Get-Together Party (*Grand Ballroom*)

Tuesday — February 26

9:00 a.m. REGISTRATION (*Normandy Lounge*)

9:30 a.m. SECOND SESSION (*Waldorf Room*)

Call to Order — 1st Vice Pres. P. B. Gordon

Report of Committee on Research — B. H. Jennings, *Chairman*

Vice Chairman — B. H. Jennings

Revised Winter Outside Design Temperatures, by H. C. S. Thom

Analysis of an Air-Conditioning Thermal Circuit by an Electronic Differential Analyzer, by G. V. Parmelee, P. Vance and A. N. Cerny (by title only)

Pulsations in Residential Heating Equipment — Preliminary Results, by A. A. Putnam and W. R. Dennis

The Dust Spot Method for Evaluating Air Cleaners, by K. T. Whitby, A. B. Algren and R. C. Jordan

Report of Tellers of Election

9:30 a.m. THIRD SESSION (*Grand Ballroom*)

Call to Order — Treas. R. A. Sherman

SYMPOSIUM ON DEHUMIDIFICATION

John Everetts, Jr., Moderator

Dehumidification by Refrigeration — Walter E. Ellis

Dehumidification by Solid Sorbents — W. L. Ross

Dehumidification by Liquid Sorbents — E. W. Gifford

Economics of Dehumidification as Related to Storage — G. A. Higgs

Typical Problems and Their Solution — E. R. Queer

12:00 noon EXPOSITION

12:15 p.m. Life Members' Dutch Treat Luncheon

1:30 p.m. Nominating Committee Meeting

7:00 p.m. Past Presidents' Dinner

Wednesday — February 27

9:00 a.m. REGISTRATION (*Normandy Lounge*)

9:30 a.m. FOURTH SESSION (*Waldorf Room*)

Call to Order — 1st Vice Pres. P. B. Gordon

Performance of Covered Hot Water Floor Panels, Part II, by E. L. Sartain and W. S. Harris

Cold Wall Effects in a Ceiling-Panel-Heated Room, by L. F. Schutrum and T. C. Min

Thermal Design of Warm Water Concrete Floor Panels — A Design Manual prepared by a subcommittee of TAC on Panel Heating and Cooling and members of the staff of the ASHAE Research Laboratory

9:30 a.m. FIFTH SESSION (*Grand Ballroom*)

Call to Order — 2nd Vice Pres. E. R. Queer

INDUSTRIAL VENTILATION SYMPOSIUM

C. H. Pesterfield, Moderator

Control of the Industrial Environment — P. J. Marschall

Local and General Atmospheric Contaminants Control — K. E. Robinson

Cleaning Industrial Effluent — J. M. Kane

Summer-Winter Comfort Ventilation for Industry — B. R. Small

The Inertia of Dust Particles and Various Consequences — W. C. L. Hemeon

12:00 noon EXPOSITION

12:30 p.m. Ladies Luncheon and Entertainment (South Shore Country Club)

7:00 p.m. ANNUAL BANQUET (*Grand Ballroom*)

Toastmaster: W. A. Kuechenberg

Speaker: Dr. Preston Bradley, Pastor of Peoples Church, Chicago

Introduction and Installation of 1957 officers

Presentation of Past President's Award to John W. James

Presentation of F. Paul Anderson Medal to M. K. Fahnestock

Thursday — February 28

9:00 a.m. REGISTRATION (*Normandy Lounge*)

9:30 a.m. SIXTH SESSION (*Waldorf Room*)

Call to Order — Pres. John W. James

Outlet Characteristics That Affect Downthrow of Heated Air Jets, by Linn Helander, Shee-Mang Yen, and Wilson Tripp

Air Flow in Free Convection over Heated Bodies, by T. F. Hatch and D. Barron-Oronzco

Radioactive Process Ventilation, by S. H. Glassmire, Jr. and J. B. Wahlen

Report of Resolutions Committee

Unfinished Business

New Business

Adjournment

12:00 noon EXPOSITION

1:00 p.m. Organization Meeting of 1957 Council

Council Confers Five Fellow Memberships

The By-Laws as revised in 1956 provide the grade of Fellow and specifies that the grade could be conferred by Council on Members who have attained unusual distinction. At its meeting on October 21, Council voted to confer this grade on 5 members who thus become the first to hold the new grade of membership. Conferring of these grades is to take place at the 63rd Annual Meeting. Following are short biographies outlining highlights in the careers of these newly-elected Fellows.

W. L. Fleisher
New York, N.Y.

L. N. Hunter
Johnstown, Pa.

J. D. Kroeker
Portland, Ore.

Walter L. Fleisher, comfort air-conditioning pioneer, served as Society president, 1941; became a Life Member, 1945; and F. Paul Anderson medalist, 1953.

After graduation from the University of Pennsylvania (B.S.—1900, M.S.—1901, honorary M.E.—1931), this native Philadelphian went to New York as engineer-in-chief, Francis Brothers and Jellett. He supervised engineering of the New Amsterdam Theater's ventilating system, 1903, and one of the first theater refrigeration applications, for the Hippodrome.

Forming W. L. Fleisher & Co., Inc., 1911, he acted as president-treasurer-chief engineer. He designed first theater cooling system employing an air washer, advanced large-scale projects with by-pass system of air conditioning, invented local recirculation method, and Capillary Conditioner. Today he holds 100 American and foreign patents.

Mr. Fleisher established a consulting office, 1930; has been president of Air & Refrigeration Corp. since 1934; and during World War II, improved warship habitability and air raid shelters.

Society activities included Council membership; chairmanship of Committee on Research, Guide Publication Committee, Executive Committee; presidency, New York Chapter. He is a fellow, *ASRE*; honorary member of *Mechanical Contractors*; life member, *ASME*; member, Academy of Sciences, Princeton University Engineering Advisory Board, and Princeton Club; recipient, University of Pennsylvania hundred year Engineering Citation; contributor, various technical publications; speaker, U.S. and abroad.

L. N. Hunter, Society president, 1954, has engaged in heating research for 30 years. Mr. Hunter, senior vice president for engineering and research, National-U.S. Radiator Corp., Johnstown, Pa., served the War Production Board, 1942-43, first as member, cast-iron boiler industry advisory committee, and later as consultant, plumbing and heating division.

He received preliminary education at Brampton, Ont., Canada, his birthplace, and was graduated from the University of Toronto, B.A.Sc., 1925. Joining Bryant Heater Co., Cleveland, he began his career as assistant research engineer. In 1930 he became associated with National Radiator Corp. He was promoted to assistant manager, 1932, and manager, research department, 1935; supervising designing, testing and research on heating and air-conditioning equipment, accessories and controls. In 1941 he was appointed vice president and manager of research, and was named to the board of directors, 1943.

Mr. Hunter has been chairman of the Society's Committee on Research, Executive, F. Paul Anderson, and Standards Committees, and member of Council. He also served the Pennsylvania Boiler Advisory Board; committees of *ASME, GAMA, I=B=R, OHHA*; board of directors, *Air Pollution Control Association*, and *SBI*; and as member, *American Chemical Society, A.G.A., American Ordnance Association, American Society for Metals.*

J. Donald Kroeker, designer of the two largest U. S. installations using reverse cycle refrigeration for heating, of J. Donald Kroeker & Associates, consulting engineers of Portland, Ore., has served as Society treasurer, 1952, and member of Council.

Mr. Kroeker, Russian-born, received his B.S., in civil engineering, Oregon State College, 1927, and M.E., 1937. Before graduation, he did thawing research, Hammon Consolidated Gold Fields, Inc., Nome, Alaska. His postgraduate associations were research and testing engineer-publications editor, *A.G.A.* Testing Laboratory, Cleveland, 1927-30; development engineer, Pennsylvania Furnace & Iron Co., Warren, Pa., 1930-32; business owner, Salem, Ore., 1932-35. He has maintained a consulting engineering practice since 1936, exclusive of World War II service as lieutenant colonel, Corps of Engineers, U. S. Army.

Author of numerous technical articles, he has written papers on heat pump applications appearing in TRANSACTIONS. He has been chairman, Standards Committee; member, Long-Range Planning Committee, TAC on Heat Pump, many others. He was first president, Oregon Chapter, 1939; first editor, *The Oregon Diffuser*. He holds membership in *ASME, SAME, ASRE*, Phi Kappa Phi, Tau Beta Pi, Sigma Tau, Sigma Delta Chi. He is listed in *Who's Who in Engineering* and *Who's Who in Commerce and Industry*.

Charles S. Leopold, air-conditioning designer for notable public buildings, was recipient, 1955, of the Society's F. Paul Anderson Medal, the Brown Medal presented by Franklin Institute, Philadelphia, for research and development of air-conditioning techniques, and a citation by the University of Pennsylvania for engineering leadership and civic participation.

He received a B.S. in electrical engineering from the University of Pennsylvania, 1917 (E.E., 1947). During World War I, he served as an ensign in U. S. Naval Reserve. Since 1923 he has maintained a consulting engineering office in Philadelphia, his birthplace.

His projects include air conditioning and electrical design, Pentagon Building; air conditioning U. S. Capitol, Cold) House Office Building, New York Stock Exchange, Madison Square Garden, and Convention Hall, Philadelphia.

Journal Section

C. S. Leopold
Philadelphia, Pa.

Mr. Leopold, co-author of a 1925 study on air filtration for asthma-hay fever relief, has written technical papers on tobacco smoke control, comfort conditions, panel cooling, radiation and thermal storage. He developed a method of controlled air supply for testing carburetors for airplane engines during World War II.

Society service includes membership, Council, Committee on Research; chairmanship, Guide Publication Committee. He is a fellow, *Royal Society of Arts;* fellow and past president, *ASRE;* member, *Franklin Institute*, Sigma Xi, Eta Kappa Nu, Engineers Club (Philadelphia).

S. R. Lewis
Chicago, Ill.

Samuel R. Lewis, consulting engineer and author of engineering textbooks, is a partner, Samuel R. Lewis & Associates, Chicago. The Society honored him as president, 1914; Life Member, 1943; F. Paul Anderson medalist, 1950; and 50-year member, 1955.

He was born and educated near Ottawa, Ill. Starting with Lewis & Kitchen, Kansas City, Mo., and Chicago, 1896, he opened a consulting office in Chicago in 1925.

Among his projects are heating-cooling systems at the Universities of Chicago, Illinois, Northwestern, Ohio State, and Indiana. He has been consultant, boards of education, Chicago, Toledo and Columbus, Ohio; designer, World War II, U. S. air raid warning stations; and was concerned with mechanical equipment, Atomic Energy Commission laboratories at University of Chicago, Oak Ridge, Tenn., and Argonne National Laboratory.

The initiator of advanced methods, he wrote *Air Conditioning for Comfort*, 1932; was author of *Railway Air Conditioning, Piping for Seagoing Vessels, Plumbing, Heating, Ventilating and Air Conditioning;* co-author, *Air Conditioning and Refrigeration*, with B. H. Jennings.

Besides serving as member of the Society's Council and Speakers Bureau, chairman of Committee on Research, Guide Publication Committee, he was a founder, and president, 1911, of the first chapter, Illinois. He is a member, *ASRE, National District Heating Association, Western Society of Engineers, Chicago Association of Consulting Engineers.*

METALS FOR TEMPERATURES ABOVE 1600 F

Need for greater efficiency in heat engines has created a demand for metals to withstand the higher temperatures. Steam power plant design engineers are pushing temperatures and operating pressures beyond the safe operating limits of the ferritic steels now in use. Those concerned with guided missiles and gas turbines are prepared to design for operation at temperatures higher than the 1600 F limit to which they have been confined for want of materials capable of satisfactorily withstanding higher temperatures of operation.

A recent bulletin *ASTM* Special Technical Publication No. 174) attempts to provide a basis of evaluation of a number of metallic materials, including cermets, which have been undergoing study in laboratories both here and abroad, to determine their suitability for higher temperature service. The papers, drawn from a symposium on the subject, discuss properties—physical, chemical and mechanical—as well as methods of combating surface deterioration that are affected by temperature. Copies can be obtained direct from *American Society for Testing Materials* at $3.50 each.

CARRIER RESEARCH SUBSIDIARY IN DENVER

It is announced that Colorado Research Corp. with headquarters in Denver has been formed a subsidiary of Carrier Corp.

Initially, the new organization will confine itself to the fields of electronics and applied physics. Its services, including model shop facilities, will be available to government and educational institutions as well as to industry. Special work related to air conditioning will be done for Carrier Corp.

Administration and laboratory facilities of Colorado Research Corp. are at 4697 and 4771 East Evans Ave., Denver.

HIGH TEMPERATURE MEASUREMENT

Methods used in measuring temperatures of metals at up to 1600 F, and the accuracy of such measurements are covered in bulletin *ASTM* Special Technical Publication No. 178) recently made available. The material originated in a panel discussion on the subject. Contains a good outline of the usual pyrometric practices now in use and permits an insight into some of the problems encountered. Bulletin obtainable direct from *American Society for Testing Materials*, price $1.50 per copy.

SOLAR HOUSES

In a recent issue of *The Sun at Work*, a news letter of the *Association for Applied Solar Energy*, appears a statement to the effect that plans are afoot for erecting a new solar house in Boston which is planned to receive 90 percent of its heating requirements from the sun. It is also reported that E. A. Allcut at the University of Toronto hopes that a solar house can be built in Toronto to study the use of solar heating in that climate. G. O. G. Lof, Denver, Colo., has a solar heated house whose construction was well under way at the time of the report. It is expected that interesting information concerning the use of solar heat for houses will eventually result from these installations.

STACK SPRAY DUST COLLECTORS

A recent study was made at Columbus, Ohio, at the laboratory of Bituminous Coal Research, Inc., to investigate the effectiveness of spray type dust collectors in a 24 inch experimental stack. Three types of spray nozzles were investigated with the results shown in a published bulletin available at 25 cents a copy. As a result of the studies, it was concluded among other things that spray collection efficiency is governed more by the water rate than by nozzle make or type. It was also in-

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dicated that a dust collector efficiency of from 60 to 70 percent might be expected with correct water rates.

Walford Authors British Institution Paper

One of the papers on the program at a Sessional Meeting of the *Institution of Heating and Ventilating Engineers* in London recently was entitled *The Mechanical Services of Large Canadian Office Buildings*, by L. C. A. Walford. Mr. Walford is a long-time member of the Society and of the firm of Wiggs, Walford, Frost and Lindsay, Toronto.

COAL AND ASH HANDLING

Particularly useful in schools, churches and other small buildings whose normal coal consumption would be less than 5000 tons per year, is information contained in a bulletin of Bituminous Coal Research, Inc., entitled *Coal and Ash Storage and Handling*, and available at 35 cents per copy. It includes information useful to engineers called upon to design or construct coal and ash handling facilities in buildings of this character. Included is information concerning bin capacity, bin construction for the coal supply and some information concerning the handling and disposition of ashes in such buildings.

POWER CONFERENCE AT ILLINOIS TECH

The Society is one of the 9 technical societies and 14 universities cooperating with the Illinois Institute of Technology, Chicago, in the 19th annual American Power Conference. This conference is being held at the Hotel Sherman in Chicago on March 27-29, 1957. Each year the conference attracts some 3,000 business and industrial executives, engineers, educators, and government officials, and provides a forum for the discussion of problems and exchange of information concerning the electric power industry and associated activities.

Members desiring further information concerning details of the conference should write direct to the conference director who is Dr. R. A. Budenholzer, professor of mechanical engineering at the Institute.

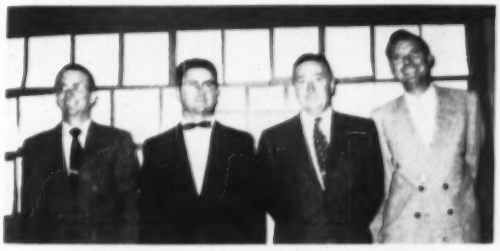
ACTIVITIES OF SOCIETY CHAPTERS

Chapter news this month includes a few items on chapters that are up and coming, as well as various notes on chapters that are up and doing.

EL PASO CHAPTER CHARTER

The Society's 65th chapter held its charter meeting on October 4 when a group of 80 gathered at the Del Camino Restaurant in El Paso, Tex. Following a social hour and dinner, J. Otis Le Beau, Jr., called the meeting to order at 8:15 p.m. and asked each one present to introduce himself to the group. He called on W. A. Byars, Jr., program chairman, who introduced John W. James, Chicago, president of the Society.

President James' subject was *The Future of Air Conditioning and the Society*. President James explained how the heating, ventilating and air-conditioning profession contributes to better living, commented on our current fuel reserves and expressed the opinion that one of the great problems of the future would be the demand for water. He discussed four categories which he considered important in the future of air conditioning for homes, schools, industry and the farm. He reviewed some of the requirements for air conditioning and ventilation, pointing out that air quantities supplied many years ago have been considerably reduced as new techniques and improvements in equipment have been developed. Some of the applications of air conditioning in the residential field were described by President James, as well as experiments at the University of California and Purdue, where farm animals have made surprising growth records under controlled conditions. He also referred to some studies in electronic cooling reported to be in progress at the Franklin Institute.



El Paso Chapter officers elected by acclamation (l. to r.) J. H. Brooks, secretary; G. H. Jackson, vice president; J. O. Le Beau, Jr., president; J. A. True, treasurer

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President James outlined the purposes of the Society, and cited the fact that the Society is a group of people working together. He said that Society research had given basic data for the wide use of air conditioning, which made the world a better place in which to live, work and sleep.

On behalf of the Council, President James then presented the charter to Mr. Le Beau. D. M. Mills, regional director for Region 6, who was introduced by President James, gave greetings from the South Texas Chapter and congratulated the El Paso group on forming the sixth chapter of Texas. Mr. Mills described the regional plan of operation, which was intended to strengthen the ties between the Society and the chapters, and pointed out that the Society's research, its publications, and its chapters are all important agencies in carrying out the Society's purposes. He described some of the Chapters Regional Meetings and said that the Regions Central Committee, consisting of the seven regional directors, was responsible for coordinating the chapter operations. He felt that in future operations the chapters will play a more direct part in the overall Society operations.

When President James called for the election of the permanent chapter officers, the following slate was proposed and elected by acclamation: *President*—J. Otis Le Beau, Jr.; *Vice President*—G. H. Jackson; *Secretary*—J. H. Brooks; *Treasurer*—J. A. True; *Board of Governors*: W. A. Byars, Jr., W. S. Cooke, Jr., and H. E. Taylor.

President James then presented a gavel to Mr. Le Beau on behalf of the last organized chapter, the Illinois-Iowa Chapter. The members voted on the adoption of the chapter by-laws which are patterned after the model chapter by-laws approved by Council. The minute book and the kardex record file was presented to the chapter secretary, Mr. Brooks. Mr. Le Beau read several congratulatory messages from Society officers and Council members and acknowledged wires and letters from many other chapters.

Charters for Two New Chapters

At the October 21 meeting of the Council, charters were granted to groups in Fort Worth, Tex., and Quebec City, Canada. Installation of these 2 Chapters will bring the total number to 67.

Chapter Programs

Considerable interest was shown at a recent ARIZONA Chapter meeting when Society Pres. John W. James, Chicago, told how *Humanity Benefits from Air Conditioning*. J. I. Yellott assisted in the projection of the accompanying slides. • • • ARKANSAS Chapter members and guests enjoyed a tour through Arkansas Power & Light Co.'s Lynch Plant. • • • At

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a following ARKANSAS Chapter meeting, W. A. Lewis, Jr., plant engineer, Reynolds Metals Co., presented statistics on the expected increase in the heating and air-conditioning field from 1955-1960. A sound film on the history and manufacturing of aluminum was shown. • • • In an informative talk on *Evaluation of Air Cleaning Equipment* made before the ATLANTA Chapter, G. F. Landgraf, vice president, engineering, Trion, Inc., McKees Rocks, Pa., mentioned the development of filtration testing technique for field and laboratory installation. • • • The district geologist in charge of ground water investigations in Maryland, E. G. Otton, gave the BALTIMORE Chapter the benefit of his knowledge of *Water for Air Conditioning*. With particular reference to the state of Maryland, Mr. Otton noted conditions which govern the flow from wells and which affect the supply. • • • BLUEGRASS Chapter members heard a presentation on insulation given by J. G. Williams, chief engineer, Gilsonite Division, American Gilsonite Co., Salt Lake City, Utah. • • • L. E. Seeley, past president of the Society and of the CONNECTICUT Chapter, advised his fellow chapter members on the reasons for and methods of service to ASHAE. Mr. Seeley is vice president in charge of engineering, The H. B. Smith Co., Inc., Westfield, Mass. • • • A brief explanation of the air-conditioning system in the New Orleans Civic Center was given to the DELTA Chapter by W. G. Moses, partner, de Laureal & Moses, consulting engineers, New Orleans, La. A lively question and answer session followed in which Mr. Moses answered all questions from the floor. • • • Paul Goliber informed the EMPIRE STATE CAPITAL Chapter about the work of the Hudson Valley Technical Institute, Troy, N.Y., of which Mr. Goliber is the director. • • • *Practical Aspects of Snow Melting* was the subject covered by L. J. La Tart, research department, Revere Copper & Brass, Inc., Rome, N.Y., at another meeting of the EMPIRE STATE CAPITAL Chapter. • • • *The Four Freedoms of Electronic Control*, freedom of response, construction, application and supervision, were named by C. M. Sanders, Jr., western manager, Transportation Division, Minneapolis-Honeywell Regulator Co., Chicago, in a talk to a large audience of ILLINOIS Chapter members and guests. Mr. Sanders discussed the application and functioning of electronic controls and compared them with electric and pneumatic controls. • • • D. H. Vance, vice president and executive engineer, The Korfund Co., Inc., Long Island City, N. Y., described *Vibration and Noise Control for Air-Conditioning Equipment* for the INDIANA Chapter. • • • A number of well-selected slides were used to illustrate a talk on the proper venting of gas appliances, given by Fred Lindsey, Metalbestos Division, William Wallace Co., Belmont, Calif., at an INLAND EMPIRE Chapter meeting. • • • Charles Yoe, KANSAS Chapter member and engineer, Shelley Electric Co., Wichita, Kans., gave a presentation for his fellow chapter members on *Practical Application of Refrigeration Piping*. Mr. Yoe outlined the many problems arising from poor piping practice in a refrigerant system, and illustrated solutions to these problems. His clear and informative talk was praised for its applicability to current problems experienced by all the members. • • • Pres. R. M. Spencer, KANSAS CITY Chapter, complimented the membership on the large audience attending the meeting at which C. M. Sanders, Jr., western manager, Transportation Division, Minneapolis-Honeywell Regulator Co., Chicago, Ill., spoke on *The Four Freedoms of Electronic Control*. • • • History, application and manufacture were the aspects covered in a presentation on *The Role of Package Boilers* by E. J. Zisek, branch manager, and G. J. Hault, engineer, New York factory office, Cyclotherm Division, National-U.S. Radiator Corp., at a MASSACHUSETTS Chapter meeting. • • • A world traveler, E. C. Bespalow, vice president, Choctaw, Inc., showed his MEMPHIS Chapter audience color slides, emphasizing the architecture and building methods of various countries. His informative talk, interspersed with wit, was well received. • • • MINNESOTA Chapter heard D. N. Berks, chief, mechanical and electrical section, Victor Gruen & Associates, Beverly Hills, Calif., talk about the Southdale Shopping Center project, a regional type shopping center. He outlined the air-conditioning system and the heat pump installations of the project. • • • *Apprenticeship and Journeymen Improvement* was the title of a constructive discussion by T. P. Stevens, Bureau of Apprenticeship, U.S. Department of Labor, for the benefit of MISSISSIPPI Chapter members. After demonstrating the need for better training of skilled and semi-skilled workmen in all our industries, Mr. Stevens described the program set up by the government to assist in doing this job. From the questions and discussion following the presentation, it was evident that this matter of better trained personnel is important to a great many members. • • • Another MISSISSIPPI Chapter meeting featured 3 speakers, all chapter members from Jackson, Miss. These were: H. S. Thomas, division sales manager, Mississippi Power & Light Co., who discussed the advantages of electrical radiant heating; B. L. Palmer, president, Palmer Air Conditioning & Heating Co., who favored the economy of gas-fired radiant heating; and R. E. Vernon, president, A-T-M Gas Equipment Co., Inc., who discussed the obligation of service to the customer on the part of the manufacturer, architect, engineer and contractor. • • • Society Pres. J. W. James gave his inspiring talk on how *Humanity Benefits from Air Conditioning* at a NEW MEXICO Chapter meeting. He described the body as a *human heat machine* sensitive to temperature, humidity, noise, and light, and noted how it responds to these factors. • • • C. H. Allen, NEW YORK Chapter guest speaker, who is associated with Bolt; Beranek and Newman, Inc., Cambridge, Mass., treated the *Attenuation of Noise in Air-Conditioning Systems*. Besides discussing the theory of sound, its generation, measurement and control, and showing method of establishing the amount of sound from equipment, Mr. Allen indicated practical ways to obtain necessary attenuation economically. The speaker outlined methods of establishing criterions for noise reduction in different types of spaces and demonstrated how to use information recently developed to determine the required attenuation. Following the presentation, Mr. Allen received a rising vote of thanks. • • • NORTH JERSEY Chapter heard P. P. Foglio, area sales manager, Combustion Control Division, Electronics Corp. of America, Boston, Mass., speak on *Safe Burning of Fuel*. • • • The president of the board of education of the Dallas Independent School District, E. L. Rippy, in a speech before the NORTH TEXAS Chapter, traced the recent rapid growth of the school system. He mentioned the possibility of having year-round schools with air conditioning in the near future. • • • A NORTHEASTERN OKLAHOMA guest speaker, W. C. Kadow, liaison engineer, Burgess-Manning Co., Chicago, Ill., discussed radiant heating and cooling through metal ceiling panels. The talk covered energy transfer by radia-

Pres. John W. James *(center)* with officers of the New Mexico Chapter: C. R. Wherrit, president; President James, Jack K. James.

Above: Pres. John W. James presents gavel given by Northern Alberta Chapter to Austin Chapter president, with Past Pres. Reg. F. Taylor and Council Member D. M. Mills, both of Houston, looking on.

Officers of the recently chartered Austin Chapter: (l. to r.) J. L. Rea, Jr., secretary; P. R. Sisler, treasurer; I. W. Wilke, and D. F. Schuett, members of Board of Governors; A. C. Lagow, vice president; and Bernard Segall, Jr., president

tion, effect of mean radiant temperature of surroundings on comfort, sensible heat removal, and ventilation rate when cooling with panels. • • • C. J. Bootes, president of the oldest Canadian Chapter, Ontario, spoke to the members of the youngest Canadian Chapter, NORTHERN ALBERTA, outlining chapter operations and extracurricular activities. At the same meeting, J. H. Ross, member of Council, described the operation of that body and stressed the importance of technical advisory committees. • • • NORTHERN ALBERTA Chapter also programmed a talk by J. H. Bryant, Canadian Industries Ltd., Edmonton, Alta., on the properties and usages of *Polyethylene Pipe*. • • • A NORTHERN OHIO guest speaker, Charles Kinser, chief, air conditioning and refrigeration department, City of Cleveland, informed his audience about various code limitations. • • • *Peaceful Uses of Atomic Energy* was the topic covered by J. E. Hart, guest speaker for the NORTHERN PIEDMONT Chapter. • • • A well received discussion on the *Selection and Application of Air Filters* was given by I. W. May, technical director, Air Filter Division, American Air Filter Co., Inc., Louisville, Ky., at an OKLAHOMA Chapter meeting. • • • P. B. Gordon, Society first vice president, New York, N.Y., gave the ONTARIO Chapter members an outstanding address on *A Contractor's Look at the Air Conditioning of Existing Office Buildings*. • • • Slides were used to accompany an excellent talk given before the OREGON Chapter by K. N. Flocke, assistant director, Occupational Health Section, Oregon State Board of Health, Portland, Ore. • • • OREGON Chapter members also enjoyed a presentation on pumps and their application, given by Clyde Retter, sales manager, Industrial Division, Pacific Pumping Co., at a following meeting. • • • *New Developments in High Velocity Air Distribution* was the topic treated by C. M. Wilson, general sales manager, Anemostat Corporation of America, New York, N.Y., in a talk to the PACIFIC NORTHWEST Chapter. Mr. Wilson discussed high velocity double duct systems and high velocity single duct zoned systems. His blackboard sketches and advice from the *voice of experience* were well received by the audience. • • • Society Pres. John W. James, Chicago, Ill., provided the PHILADELPHIA Chapter with answers to the question, *Does Air Conditioning Provide a Healthy Environment?* • • • The provocative title, *At Last, a Practical Heat Pump*, was applied to a talk by R. G. Werden, industrial sales manager, York Corp., Philadelphia, Pa., presented at a joint ASHAE-*ASRE* meeting, with *ASRE* playing host to the PITTSBURGH Chapter. • • • The highlight of a ROCKY MOUNTAIN Chapter meeting was a panel discussion of *Contractors' Views of Mechanical Plans and Specifications*. The panel included Stewart White, Midwest Plumbing & Heating Co.; Ray Gillespie, Natkin & Co.; and J. F. McCauley, J. F. McCauley, Inc.; with H. W. Marshall, Marshall & Johnson, acting as moderator. Noncontroversial questions on improvement of mechanical plans and job quotations were ably handled by the panel and moderator. • • • *Growth of Electric Utilities in South Carolina* was discussed by Alan Mustard, South Carolina Electric & Gas Co., at a SOUTH CAROLINA Chapter meeting. Sidelights of this interesting talk touched on public and private power generation and distribution, and atomic power. • • • Continuing the development theme, a second SOUTH CAROLINA Chapter meeting featured a talk on the growth of gas distributing companies in the area, given by J. G. Hopping, Jr., industrial engineer, Piedmont Natural Gas Co., Inc., Charlotte, N.C. • • • SOUTH TEXAS Chapter learned about *Noise Criteria and Sound Control in the Air-Conditioning Industry* from a presentation by D. B. Callaway, West Coast manager, industrial sound control department, Koppers Co., Inc., Pittsburgh, Pa. Mr. Callaway covered various means of predicting noise levels to be expected in any average air-conditioning installation. • • • *A New Look at Insulation* was supplied by W. F. Nash, branch manager, Armstrong Cork Co., Houston, Tex., in a speech before the SOUTHWEST TEXAS Chapter. • • • The members of the SOUTHWEST TEXAS Chapter also heard Gerard Baker, mechanical engineer, discuss the high velocity air-conditioning system of the U.S.A.A. building in San Antonio. • • • A panel discussion on *Base Bid or Open Bid Specifications* was the feature at a TOLEDO Chapter meeting. Those who gave their views were: R. C. Moorhead, partner, Bellman, Gillett & Richards, Toledo, Ohio; E. H. Williams, chief air-conditioning engineer, The Hausman Steel Co., Toledo; L. B. La France, sales heating controls, Minneapolis-Honeywell Regulator Co., Toledo; and William Millbratz, staff engineer, D. M. Palmer, a consulting engineer and former dean of engineering at Toledo University, acted as moderator. • • • VIRGINIA Chapter featured a talk by Mr. Lynsenmeyer on *Panel Heating and Cooling*. • • • Robert Menz, Worthington Corp., Harrison, N.J., speaking before the WESTERN MASSACHUSETTS Chapter, described packaged chillers and their application to air conditioning. He emphasized the advantages of packaged chillers over other methods of air conditioning in certain types of installations. • • • E. L. Currier, guest speaker, WESTERN NEW YORK Chapter, gave a stimulating presentation on the *Atomic Energy Committee Program for Commercial Nuclear Power*. • • • At a WISCONSIN Chapter meeting, W. H. Duckworth, Oakite Products, Inc., Milwaukee, Wis., discussed cleaning cooling coils and condensers. In his interesting talk, he outlined the procedures to be used for both the soaking and circulating methods of removing scale from pipes.

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Student Branches

A newly appointed program committee of the NORTH CAROLINA STATE COLLEGE Student Branch consists of R. J. Parker, G. L. Waitman, Finley Pace, Jr., and R. E. Moser. J. G. Daye is the chairman of this committee. • • • Members and guests of the PURDUE UNIVERSITY Student Branch visited the Powerama engineering display, Allison Engineering Division, General Motors Corp., Indianapolis, Ind. • • • The PURDUE UNIVERSITY Student Branch also enjoyed a joint meeting with the Indiana Chapter at which C. H. Pesterfield, professor of mechanical engineering, Michigan State University, discussed specifications for commercial and industrial standards of residual fuel oils. Pro-

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fessor Pesterfield also dealt with the blending of oils at the refinery, viscosity problems and smoke ordinances.

Appointments and Elections

The chairmen of the standing ARIZONA Chapter committees introduced at the greeting committee. • • • Announcement was made by Pres. L. F. Christofferson, PACIFIC NORTHWEST Chapter, of the following committee chairmen: *Membership*—E. T. Franklin, Jr.; *Attendance*—W. J. Olson; *Publicity*—M. C. Toliver; *Special Events*—W. L. Johnson; and *Program*—E. W. Triol.

Members Honored

At the ARKANSAS Chapter meeting in October, Herman Cumnock presented a past president's pin to J. L. Brown. •

Members of Dallas Chapter discuss plans for 1960 Annual Meeting

October meeting were: *Program*—E. P. Bootheroyd; *Membership*—J. J. Vargo; *Research*—W. K. Haggard; *Publicity and Publications*—J. H. Futrelle; *Legislative*—W. A. Biddle. • • • O. L. McCallister, Jr., and L. B. Moon were elected to the board of governors, ARKANSAS Chapter. • • • By unanimous election, W. G. Robertson, Jr., and R. E. Dressell were named member and alternate, BALTIMORE Chapter, Chapters Regional Committee, Region 5. • • • Members of the EMPIRE STATE CAPITAL Chapter passed a motion at their October meeting designating the chapter president to represent them as member of the Chapters Regional Committee. G. G. Davis is now serving as president. The choice for permanent alternate was R. B. Taylor. L. V. Appleby will be chairman of arrangements for the regional meeting to be held in Albany. • • • Pres. Max Tonn appointed H. U. Wright to represent INLAND EMPIRE Chapter at the Spokane Technical Professional Council. • • • Appointments announced by Pres. J. W. Doggett, Jr., at the October MISSISSIPPI Chapter meeting were: for the Chapters Regional Committee, Member—D. F. Ingram; and Alternate—F. N. North; for chapter committees, *Program*—L. J. Beasley; *Membership*—M. E. Price; *Attendance*—M. E. Arledge; *Publicity and Public Relations*—B. L. Palmer; *Finance*—W. H. Lambeth and T. D. Luke; *Special Events*—C. M. Broad; and *Audit*—A. H. Walters. • • • Two new committee chairmen appointed by Pres. J. B. Hewett, NEW YORK Chapter, are: *Membership*—C. M. Wilson; and *Reception*—P. A. Bourquin. • • • A nominating committee, composed of E. T. Gessell, C. F. Gilmore and G. A. Linskie, was selected by the NORTH TEXAS Chapter members. • • • Pres. H. W. Meinholtz, NORTHEASTERN OKLAHOMA Chapter, named R. E. Pauling and R. F. Shoemaker as a • • The attendance chairman of the KANSAS CITY Chapter, E. M. Hopkins, supervised the first operation of their incentive plan under which D. S. Truog and R. A. Nicholas were honored. • • • Following his report at the October meeting of MINNESOTA Chapter on the activities of the roster committee, G. F. Gausman was congratulated by Pres. E. T. Erickson. • • • A surprise presentation of a Life Membership certificate was made to Carl H. Flink, technical secretary of the Society and secretary of the NEW YORK Chapter, at the October chapter meeting. P. B. Gordon, Society first vice president, New York, N.Y., made the presentation. Mr. Flink also becomes a life member of New York Chapter. It was announced that a Life Membership certificate was being sent to J. L. Pfuhler, who was unable to attend the meeting. • • • Applauded at the October meeting of NORTHERN OHIO Chapter were Joseph Levin and J. F. Krohn, entertainment committee members, in recognition for their work on the fine fall clam bake. • • • P. I. L. Winsor made a gracious speech of acceptance upon receipt of his past president's pin from L. F. Christofferson, current president of the PACIFIC NORTHWEST Chapter. • • • ROCKY MOUNTAIN Chapter recognized L. L. DeLong's service with the presentation of a past president's pin. • • • R. K. Rouse received his past president's pin from J. E. McMurray, president, SOUTH CAROLINA Chapter. • • • J. F. Guest, president, TOLEDO Chapter, complimented Gershon Meckler on the news letter which he had prepared for distribution at the October meeting.

Wisconsin Air Conditioning Institute

An Air Conditioning Institute put on as one of the University of Wisconsin Engineering Institutes in cooperation with the Wisconsin Chapter of the Society was held on November 14, 15 and 16. Included among the program speakers were L. F. Flagg, Minneapolis, Minn., Sam Sachs, Chicago, Ill., W. G. Young, Rockford, Ill., and J. O. Yund, Evansville, Ind.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 97 men who are candidates for membership or advancement in membership grade.

Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before December 31, 1956, of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted upon by the Council.

Note: *Advancement †Reinstatement

Arkansas (*Region* 6)

LAMMONS, J. H., Sales Engr., Harwell & Rosselot Co., Little Rock.

California (*Region* 4)

FINK, A. G., Sales Engr., English & Lauer, Inc., Los Angeles.

LAMBERT, R. R., Pres., Air-Factors, Inc., Monrovia.

REYNOLDS, DON, Sales Prom. Mgr., Harry F. Haldeman, Inc., Los Angeles.

Connecticut (*Region* 1)

STANWICKS, W. T., Htg. Engr., Oil Heat & Engineering, Inc., West Hartford.

Florida (*Region* 5)

PARSONS, O. J., Jr., Owner, Cons. Engr., Miami.

Georgia (*Region* 5)

O'CALLAGHAN, L. J.*, Pres., Dealers Supply Co., Inc., Atlanta.

Idaho (*Region* 4)

DETWEILER, J. R.*, Projects Mgr., Detweiler Brothers, Inc., Twin Falls.

Illinois (*Region* 2)

ATKINSON, C. R., Office Mgr., L. E. Schulein Co., Chicago.

ATTERIDGE, R. G., Jr., Br. Com. Sales Mgr., Minneapolis-Honeywell Regulator Co., Peoria.

BAKER, F. G., Engrg. Prod. Mgr., American Air Filter Co., Inc., Herman Nelson Div., Moline.

BENBOW, J. P., Vice Pres., J. P. Benbow Plumbing & Heating Co., Galesburg.

DAVIDSON, LEWIS†, Partner, Sweiger-Davidson Co., Chicago.

HANNON, P. J., Serv. & Installation Mgr., Minneapolis-Honeywell Regulator Co., Peoria.

HOSCHEID, C. F., Jr., Sales Engr., Johnson Service Co., Moline.

KOETTER, J. D., Sales Engr., Minneapolis-Honeywell Regulator Co., Peoria.

KUNZ, W. A., Sales Engr., The Powers Regulator Co., Peoria.

PATTERSON, R. O., Sales Engr., The Powers Regulator Co., Chicago.

PIKSA, H. J., Mech. Engr., Kralovec & Best, Cons. Engrs., Chicago.

REGELE, C. O., Consultant, Associated Engineers, Peoria.

VANNEST, R. A., Pres., Filter Engineers, Inc., Chicago.

Indiana (*Region* 2)

HAM, G. S., Br. Mgr., National U.S. Radiator Corp., Indianapolis.

PEEK, R. E., Chief Engr., The Peerless Corp., Indianapolis.

Iowa (*Region* 3)

SCHROEDER, D. F.*, Sales Engr., The Powers Regulator Co., Des Moines.

Louisiana (*Region* 5)

HENDRY, B. C., Vice Pres., Lundin-Hendry, Inc., Baton Rouge.

MACKIE, C. W., III., Partner, C. W. Mackie Co., New Orleans.

Maryland (*Region* 5)

ELLIS, J. T., Jr. Sales Engr., American Air Filter Co., Baltimore.

HARON, A. S.*, Sr. Engr., Glenn L. Martin Co., Baltimore.

VERNER, A. E., Mech. Engr., Riggs Distler & Co., Inc., Baltimore.

Massachusetts (*Region* 1)

BERRY, R. C.*, N. E. Dist. Mgr., McDonnell & Miller, Inc., Boston.

LEGG, W. E., Mgr. & Engr., May Engineering Co., Pittsfield.

Minnesota (*Region* 3)

ROTH, J. B., Sales Repr., Wm. Bros Boiler & Manufacturing Co., Minneapolis.

Mississippi (*Region* 5)

WHITE, B. H., Dist. Sales Mgr., Industries Sales Corp., Jackson.

Missouri (*Region* 3)

BRODZ, W. W., Sales Engr., J. S. Malone & Associates Inc., St. Louis.

CUSHING, G. H., Sales Engr. Trainee, The Powers Regulator Co., Kansas City.

GRANT, R. L., Sales Engr., The Trane Co., Kansas City.

HAMMOND, J. R., Vice Pres., Huxtable Engineering Co., Inc., Kansas City.

LEVINSON, D. S.*, Sales Engr., J. S. Malone & Associates Inc., St. Louis.

SCHREI, H. J., Chief Mech. Engr., Bank Building & Equipment Corp., St. Louis.

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Journal Section

OBITUARIES

HARRY M. NOBIS
Lakewood, Ohio

Heinrich (Harry) M. Nobis, a Life Member of the Society, died at his home in Lakewood, Ohio, on September 7 at the age of 72. He had been ill since January, when he returned from a government consulting mission in Europe.

The holder of several patents in the heating and ventilating field and author of technical articles, Mr. Nobis had over 50 years experience in the heating field.

Mr. Nobis, German-born, worked in Germany, Belgium, and Montreal, Que., before starting his own business in Toronto, Ont., in 1911. Shortly thereafter he moved to the United States and joined The Weiss Heating & Plumbing Co., Cleveland, Ohio. For a number of years following, he maintained a consulting engineering company in East Cleveland, and later in Cleveland. In 1948 he became associated with Warner & Swasey Co., Cleveland. He was retired at the time of his death.

Surviving are his wife, Mary Jane, two daughters, Mrs. Gretchen Garnett and Mrs. Nora Stine; a son, Charles; and five grandchildren.

HANS J. ZACK
Chicago, Ill.

The Society has been informed of the recent death of Hans J. Zack, president, Zack Co., Chicago, Ill. Mr. Zack, a member of the Society since 1928, was affiliated with the Illinois Chapter.

He was born in Racine, Wis., in 1894. Previous to World War I army service, he worked as a ventilating mechanic. He was in the ventilation contracting business since 1923.

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Minimum Ventilation Requirements for Air Conditioned Spaces: Albert Giannini, Chairman; C. B. Gamble, R. A. Gonzalez, W. J. McConnell, M.D., R. J. Salinger, H. G. Strong.

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ASHAE-ASRE Committee on Cooperation: ASHAE Representatives — C. B. Gamble, L. N. Hunter, E. R. Queer. **ASRE** Representatives — Cecil Boling, A. J. Hess, H. F. Spoehrer.

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Exposition: E. N. McDonnell, Chairman; John E. Haines, L. N. Hunter.

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NRC—National Academy of Sciences, Div. of Engrg.: L. E. Seeley.

Nuclear Energy Engineering: R. A. Sherman, Chairman; W. F. Friend, W. A. Grant, L. N. Hunter, B. H. Jennings (Committee on Research).

•

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ASHAE — OFFICERS OF CHAPTERS AND BRANCHES

(65 Chapters: 1 Special Branch; 6 Student Branches)

Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

ARIZONA

Arizona: 1953. Hdqrs., Phoenix. Meets, 1st Mon. PRES, J. B. Hoagland, 1923 W. Osborn Rd. SECY, F. W. Gabbard, 111 East 14th St., Tempe.

ARKANSAS

Arkansas: 1952. Hdqrs., Little Rock. Meets, 3rd Tues. PRES, J. W. Thompson, 900 Center St. SECY, K. A. Pettit, 904 Wallace Bldg.

CALIFORNIA

Golden Gate: 1937. Hdqrs., San Francisco. Meets, 1st Thurs. PRES, F. K. Crouch, 906 Cerrito St., Albany (6). SECY, J. B. Smith, 1129 Folsom St.

Sacramento Valley: 1952. Hdqrs., Sacramento. Meets, 1st Wed. PRES, V. W. Thornburg, 2470 27th Ave. SECY, S. W. Doolittle, 581 Swanston Dr.

Southern California: 1930. Hdqrs., Los Angeles. Meets, 1st Tues. PRES, H. F. Ulovec, 3886 Olympiad Dr. (43). SECY, A. Z. Levine, 239 S. Oxford Ave. (4).

COLORADO

Rocky Mountain: 1944. Hdqrs., Denver. Meets, 1st Wed. PRES, A. S. Widdowfield, 1925 Blake St. (2). SECY, R. T. Beck, 1304 Cherokee St. (4).

CONNECTICUT

Connecticut: 1940. Hdqrs., New Haven. Meets, 3rd Thurs. PRES, Walter Heywood, 1007 Farmington Ave., West Hartford. SECY, R. B. Cahoon, 1326 Whalley Ave. (15).

DISTRICT OF COLUMBIA

Washington, D.C.: 1935. Hdqrs., Washington, D.C. Meets, 2nd Wed. PRES, J. R. Broome, 4926 Wisconsin Ave. (16). SECY, J. W. Morgan, 2117 M Street, N.W.

GEORGIA

Atlanta: 1937. Hdqrs., Atlanta. Meets, 2nd Mon. PRES, F. W. Bull, 1205 Spring St., N.W. SECY, J. S. Edgar, 2015 Peachtree Rd., N.W.

ILLINOIS

Illinois: 1906. Hdqrs., Chicago. Meets, 2nd Mon. PRES, H. G. Gragg, 228 N. LaSalle St. (1). SECY, Herbert Kreisman, 117 N. Desplaines St. (6).

Illinois-Iowa: 1956. Hdqrs., Moline. PRES, R. L. Graham, 301 Safety Bldg., Rock Island. SECY, D. H. Ninow, 1824 3rd Ave.

INDIANA

Indiana: 1943. Hdqrs., Indianapolis. Meets, 4th Tues. PRES, A. O. Roche, Jr., 3950 Broadway (5). SECY, W. F. Currise, 619 Architects & Builders Bldg. (4).

IOWA

Iowa: 1940. Hdqrs., Des Moines. Meets, 2nd Tues. PRES, D. E. Schroeder, 2717 Cambridge. SECY, R. T. Howard, Jr., 220 Davidson Bldg.

KANSAS

Kansas: 1951. Hdqrs., Wichita. Meets, Tues. after 1st Mon. PRES, H. M. Skalla, 2639 Sennett (16). SECY, J. C. Mikesell, 5426 E. Pine (6).

KENTUCKY

Bluegrass: 1954. Hdqrs., Louisville. Meets, 2nd Mon. PRES, W. J. Killian, 215 Central Ave. (8). SECY, A. E. Handmaker, 500 Bergman Ave. (8).

LOUISIANA

Baton Rouge: 1955. Hdqrs., Baton Rouge. Meets, 3rd Wed. PRES, J. F. Naylor, Jr., 5363 Greenwell Springs Rd., P.O. Box 4688 Audubon Station. SECY, W. J. Le Blanc, 3185 Government St.

Delta: 1939. Hdqrs., New Orleans. Meets, 3rd Tues. PRES, R. N. Stall, 840 Baronne St. (12). SECY, O. F. Schully, 840 Baronne St.

Shreveport: 1948. Hdqrs., Shreveport. Meets, 3rd Thurs. PRES, H. L. Scott, 1020 Market St., P.O. Box 1821. SECY, L. E. Knapp, P.O. Box 1382.

MARYLAND

Baltimore: 1949. Hdqrs., Baltimore. Meets, 3rd Wed. PRES, W. G. Robertson, Jr., 2315 St. Paul St. (18). SECY, C. E. McCaffray, Huntingdon Ave. at 26th (11).

MASSACHUSETTS

Massachusetts: 1912. Hdqrs., Boston. Meets, 3rd Tues. PRES, W. G. Martin, Jr., 64 Moulton St., Cambridge (38). SECY, F. J. Butler, 129 Malden St. (18).

Western Massachusetts: 1955. Hdqrs., Springfield. PRES, J. E. Reed, 57 Main St., Westfield. SECY, C. R. Munn, 29 Logan St.

MICHIGAN

Michigan: 1916. Hdqrs., Detroit. Meets, 1st Mon. after 10th of month. PRES, J. N. Livermore, 2000 Second Ave. (26). SECY, J. B. Olivieri, 37294 Iliene, Mt. Clemens.

Western Michigan: 1931. Hdqrs., Grand Rapids. Meets, 2nd Mon. PRES, F. L. Murray, 482 W. Michigan Ave., Battle Creek. SECY, R. J. Waalkes, 500 E. 8th St., Holland.

MINNESOTA

Minnesota: 1918. Hdqrs., Minneapolis. Meets, 1st Mon. PRES, E. T. Erickson, 500 Investors Bldg. (2). SECY, J. H. Jester, 621 E. Hennepin Ave.

MISSISSIPPI

Mississippi: 1953. Hdqrs., Jackson. Meets, 4th Mon. PRES, J. W. Doggett, Jr., 254 Kimbrough Dr. SECY, D. F. Ingram, 408 W. Fortification St.

MISSOURI

Kansas City: 1917. Hdqrs., Kansas City. Meets, 1st Mon. PRES, R. M. Spencer, 1510 Main St. SECY, J. E. Miller, 5830 Outlook, Mission, Kan.

St. Louis: 1918. Hdqrs., St. Louis. Meets, 2nd Tues. PRES, W. P. Norris, 6338 Waterman Ave. (5). SECY, K. O. Williams, 3200 Oliver Ave., E. St. Louis, Ill.

NEBRASKA

Nebraska: 1940. Hdqrs., Omaha. Meets, 2nd Tues. PRES, L. J. Paulsen, 1901 S. 39th St. SECY, E. N. Seiler, 1824 N. 53rd St.

NEW JERSEY

North Jersey: 1952. Hdqrs., Newark. Meets, 2nd Tues. PRES, W. C. Kruse, Jr., 183 N. 13th St. (7). SECY, S. H. Nitzberg, P.O. Box 157, Wood-Ridge.

NEW MEXICO

New Mexico: 1954. Hdqrs., Albuquerque. Meets, 3rd Tues. PRES, C. R. Wherritt, 4138-A Trinity Dr., Los Alamos. SECY, R. G. Merryman, 592 Kiva St., Los Alamos.

NEW YORK

Central New York: 1944. Hdqrs., Syracuse. Meets, 4th Wed. PRES, H. J. Morton, 122 Lincoln Ave. SECY, E. L. Moyer, R. D. 2, Jamesville.

Empire State Capital: 1951. Hdqrs., Albany. Meets, 2nd Wed. PRES, G. G. Davis, 111 S. Church St., Schenectady. SECY, M. E. Waddell, 1623 Central Ave.

New York: 1911. Hdqrs., New York. Meets, 3rd Mon. PRES, J. B. Hewett, 64 Buena Vista Dr., Dobbs Ferry. SECY, Carl H. Flink, 62 Worth St. (13).

Western New York: 1919. Hdqrs., Buffalo. Meets 2nd Mon. PRES, V. N. Harwood, 250 Delaware Ave. (2). SECY, J. F. Bedard, 505 Franklin St.

NORTH CAROLINA

Northern Piedmont: 1952. Hdqrs., Greensboro. Meets, 2nd or 3rd Fri. PRES, L. R. Gorrell, 1412 Chester Rd., Raleigh. SECY, C. E. Amick, 1042 Oakmont Ave.

Southern Piedmont: 1952. Hdqrs., Charlotte. PRES, J. A. Rice, 719 E. Worthington Ave. SECY, E. D. Streng, P.O. Box 4083.

OHIO

Central Ohio: 1944. Hdqrs., Columbus. Meets, 3rd Mon. PRES, W. A. Schoonover, 2901 N. High St. (2). SECY, R. C. Liebert, 623 N. High St. (11).

Cincinnati: 1932. Hdqrs., Cincinnati. Meets, 1st Tues. PRES, R. G. Anderson, 1758 Elmore St. (23). SECY, C. P. Krantz, 2308 W. 8th St. (4).

Miami Valley: 1950. Hdqrs., Dayton. Meets, 1st Wed. PRES, J. B. Rishel, 397 W. 1st St. (2). SECY, R. B. Walcott, 2340 E. River Rd. (9).

Northern Ohio: 1916. Hdqrs., Cleveland. Meets, 2nd Mon. PRES, H. R. Canoyer, 1900 Superior. SECY, R. D. Wilson, 2142 E. 19th St. (15).

Toledo: 1954. Hdqrs., Toledo. PRES, J. F. Guest, 1815 N. 13th St. SECY, Robert Greenwald, 2525 Portsmouth Ave. (13).

OKLAHOMA

Oklahoma: 1935. Hdqrs., Oklahoma City. Meets, 2nd Mon. PRES, F. R. Denham, 320 Oklahoma Natural Bldg. (2). SECY, W. R. Johnson, 120 E. Main.

Northeastern Oklahoma: 1948. Hdqrs., Tulsa. Meets, 2nd Tues. PRES, H. W. Meinholtz, Box 2261. SECY, H. L. Cauvel, 3342 East 41st St.

OREGON

Oregon: 1939. Hdqrs., Portland. Meets, Thurs. after 1st Tues. PRES, W. R. Norte, 2225 N. E. Broadway (12). SECY, G. G. Van Aist, 947 S. E. Market.

PENNSYLVANIA

Philadelphia: 1916. Hdqrs., Philadelphia. Meets, 2nd Thurs. PRES, C. J. Lubking, 3345 W. Hunting Park Ave. (32). SECY, Ludwig Mack, 412 W. Hortter St. (19).

Pittsburgh: 1919. Hdqrs., Pittsburgh. Meets, 3rd Mon. PRES, R. M. Toucey, 223 Fourth Ave. (22). SECY, G. E. Smetzer, 1238 Brighton Rd. (23).

SOUTH CAROLINA

South Carolina: 1954. Hdqrs., Columbia. PRES, J. E. McMurray, 1639 Blanding St. SECY, A. L. Blackstone, Jr., 1630 Laurel St.

TENNESSEE

Memphis: 1944. Hdqrs., Memphis. Meets, 3rd Mon. PRES, W. L. Henson, 496 S. Main St. SECY, G. B. Ramsey, Jr., 157 Neil St. (3).

TEXAS

Austin: 1956. Hdqrs., Austin. PRES, B. E. Segall, Jr., 705 N. Lamar. SECY, J. L. Rea, Jr., 300 W. 8th St., P.O. Box 5206.

El Paso: 1956. Hdqrs., El Paso. PRES, J. O. LeBeau, Jr., 1021½ E. Missouri. SECY, J. H. Brooks, 4028 Hamilton St.

North Texas: 1938. Hdqrs., Dallas. Meets, 3rd Mon. PRES, H. G. Gregerson, 4512 Livingston (5). SECY, Ross Zumwalt, 929 Mercantile Securities Bldg. (1).

South Texas: 1938. Hdqrs., Houston. Meets, 3rd Fri. PRES, J. C. Lewis, Box 8188. SECY, E. B. Appling, 4101 San Jacinto St. (4).

Southwest Texas: 1946. Hdqrs., San Antonio. Meets 3rd Tues. PRES, Boone Crisp, Rt. 2, Box 421. SECY, D. T. Kern, 14 Chandler Bldg. (5).

West Texas: 1953. Hdqrs., Lubbock. Meets, 1st Tues. PRES, J. C. Wharton, P. O. Box 1240. SEGY, D. G. Halley, 3608 Ave. A.

UTAH

Utah: 1944. Hdqrs., Salt Lake City. Meets, 3rd Thurs. PRES, W. L. Stuewe, 1472 S. State St. (4). SECY, W. C. Leslie, 307 W. 2nd St.

VIRGINIA

Virginia: 1946. Hdqrs., Norfolk. Meets, 3rd Wed. PRES, C. G. Conaway, Jr., 7454 Hanx Ave. (5). SECY, E. R. Simpson, Jr., 720 Guy St.

WASHINGTON

Inland Empire: 1950. Hdqrs., Spokane. Meets, 1st Mon. PRES, Max Tonn, 4021 S. Latawah. SECY, R. D. Nevers, E. 124 Augusta, P.O. Box 5026 (21).

Pacific Northwest: 1928. Hdqrs., Seattle. Meets, 2nd Tues. PRES, L. F. Christofferson, 425-1411 Fourth Ave. Bldg. (1). SECY, H. M. Hendrickson, Mech. Engrg. Dept., University of Washington (5).

WISCONSIN

Wisconsin: 1922. Hdqrs., Milwaukee. Meets, 3rd Mon. PRES, H. K. Foriar, 1400 E. Park Pl. (11). SECY, H. W. Snyder, 5520 W. Burleigh (10).

CANADA

British Columbia: 1952. Hdqrs., Vancouver. Meets, 2nd Wed. PRES, D. W. Thomson, 1690 W. Broadway (9). SECY, W. F. Keenan, 54 W. Fifth Ave. (10).

Manitoba: 1935. Hdqrs., Winnipeg. Meets, 4th Thurs. PRES, A. H. Miller, 342 Mandeville St. (12). SECY, R. M. Fraser, 1855 Sargent Ave. (12).

Montreal: 1936. Hdqrs., Montreal. Meets, 3rd Mon. PRES, S. R. Plamondon, City Planning Dept., Smoke Control Division, City Hall. SECY, Arthur DeBreyne, 9 St. Denis St., St. Lambert.

Northern Alberta: 1956. Hdqrs., Edmonton. Meets, 3rd Wed. PRES, W. G. Woods, 12908 116 Ave. SECY, E. K. Cumming, 10249 104 St.

Ontario: 1922. Hdqrs., Toronto. Meets, 1st Mon. PRES, C. J. Bootes, 15 Torbarrie Rd., Downsview. SECY, H. R. Roth, Rm. 407, 57 Bloor St., W.

Ottawa Valley: 1952. Hdqrs., Ottawa. Meets, 3rd Tues. PRES, D. W. Banton, 360 Richmond Rd. (3). SECY, Jacob Klassen, 454 Slater St. (4).

SPECIAL BRANCH

Switzerland: 1952. Hdqrs., Zurich. PRES, Walter Hausler, Erbstrasse 2, Kusnacht. SECY, L. F. de Bruyn, Heschgasse 45.

STUDENT BRANCHES

North Carolina State College: 1948. Faculty Adviser: Prof. R. B. Knight, M. E. Dept., Raleigh, N. C.

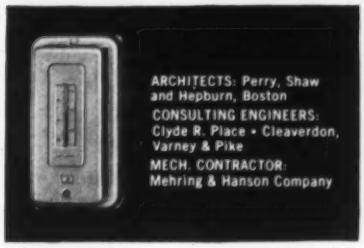
Oregon State College: 1949. Faculty Adviser: Prof. G. E. Thornburgh, M. E. Dept., Corvallis, Ore.

Purdue University: 1948. Faculty Adviser: Prof. F. B. Morse, M. E. Dept., West Lafayette, Ind.

Texas A. & M. College: 1946. Faculty Adviser: Prof. L. S. O'Bannon, M. E. Dept., College Station, Tex.

University of Detroit: 1949. Faculty Adviser: Prof. J. E. Lay, M. E. Dept., Detroit, Mich.

University of Toronto: 1951. Faculty Adviser: Prof. F. G. Ewens, M. E. Dept., Toronto, Ont., Canada.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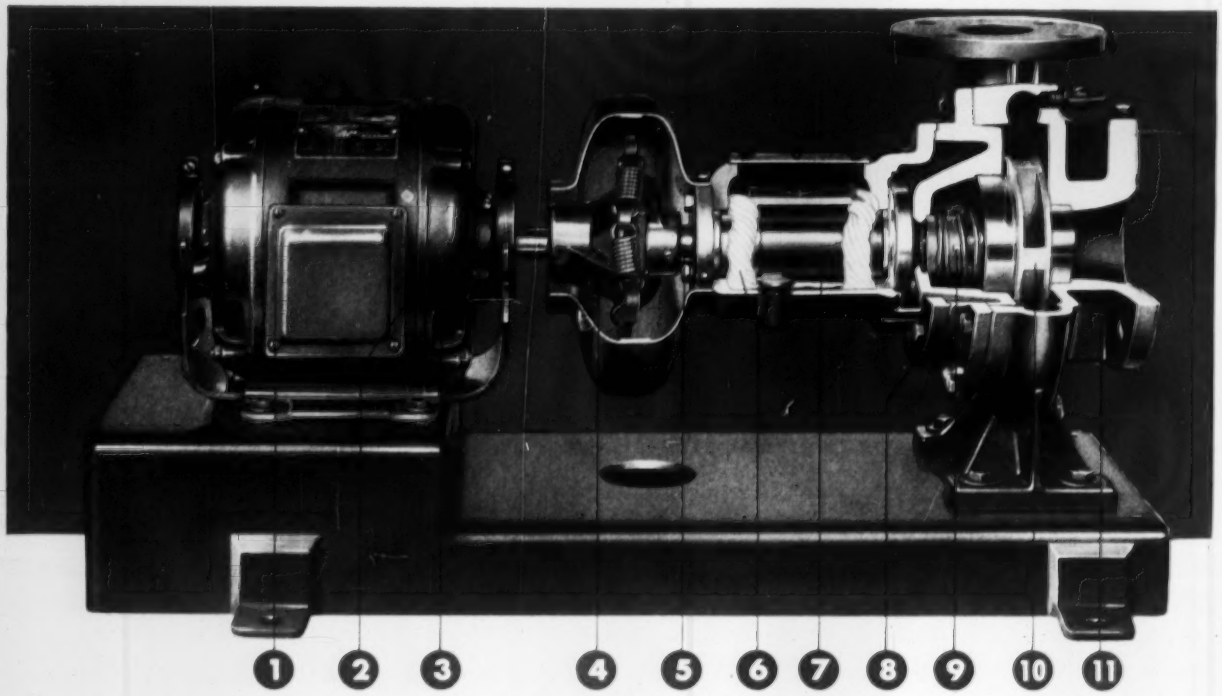

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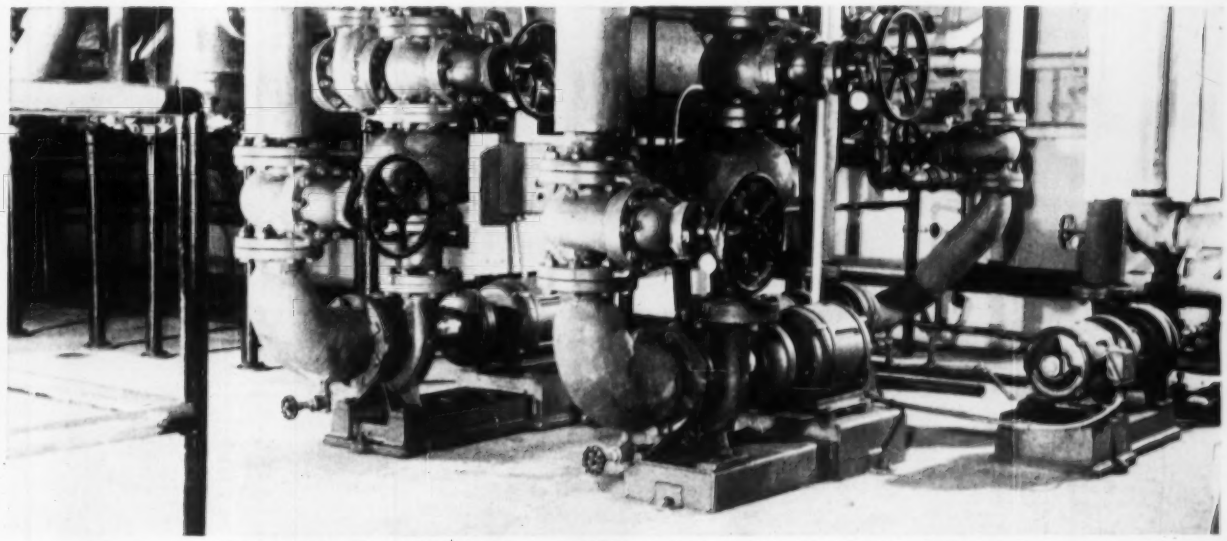

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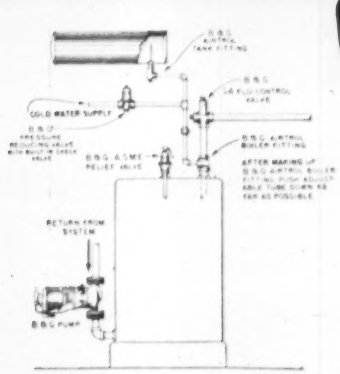

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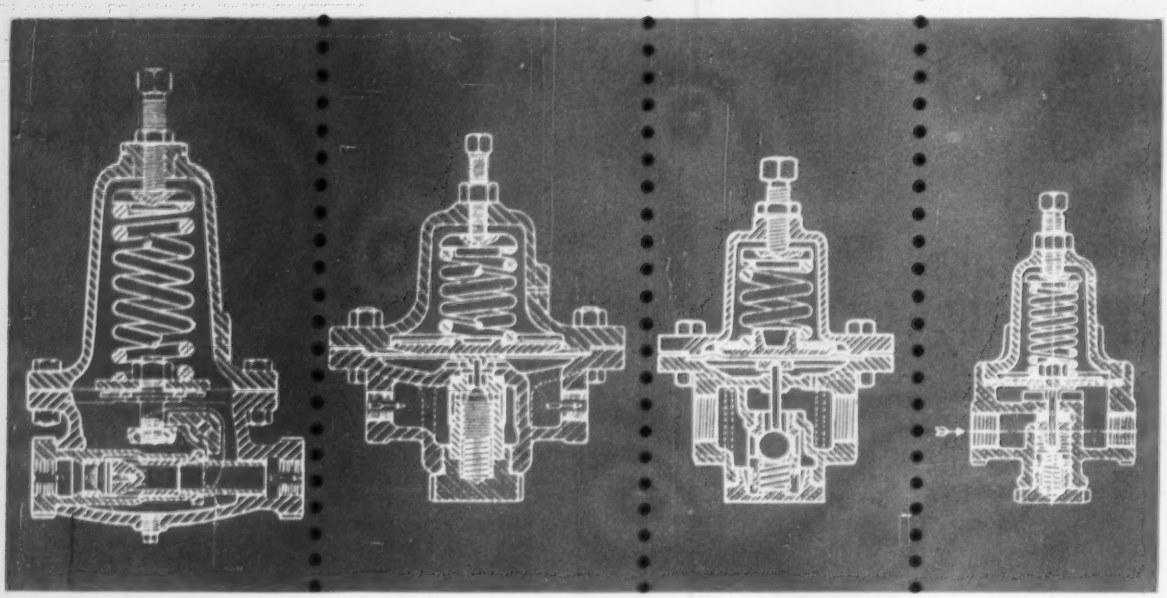

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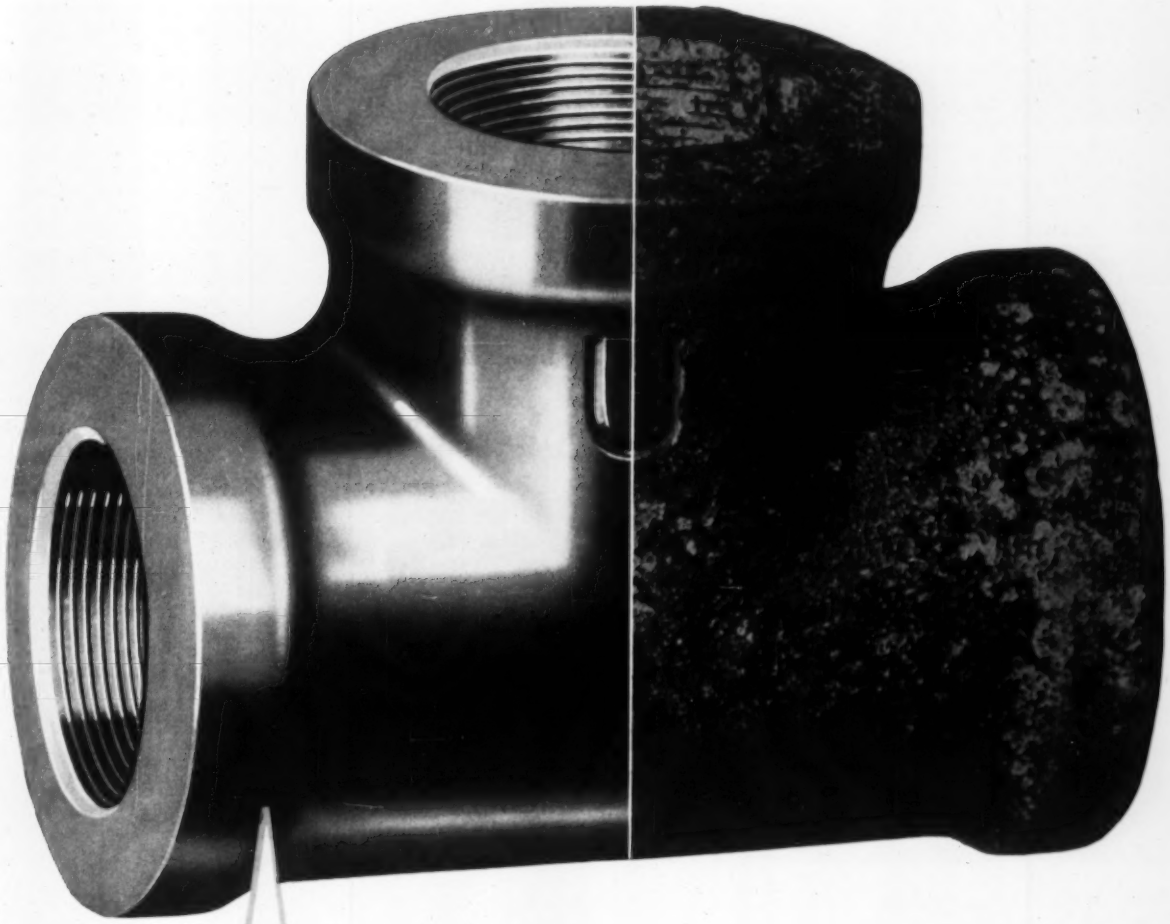

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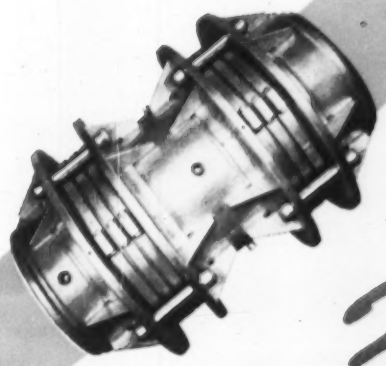
Zallea Brothers design and build expansion joints for every requirement of modern industry. Field tests have proved the value of our emphasis on designing the expansion joint to fit the problem. Records show that Zallea Expansion Joints outlast all other packless expansion joints from 90% to as much as 1200%. Such reliability is further proof of Zallea design superiority.

Zallea representatives are always ready to help solve problems relating to Expansion joints. Or if you prefer, write today on your company letterhead for your copy of Catalog 56, our newly published 72-page comprehensive expansion joint manual.



Zallea expansion joints

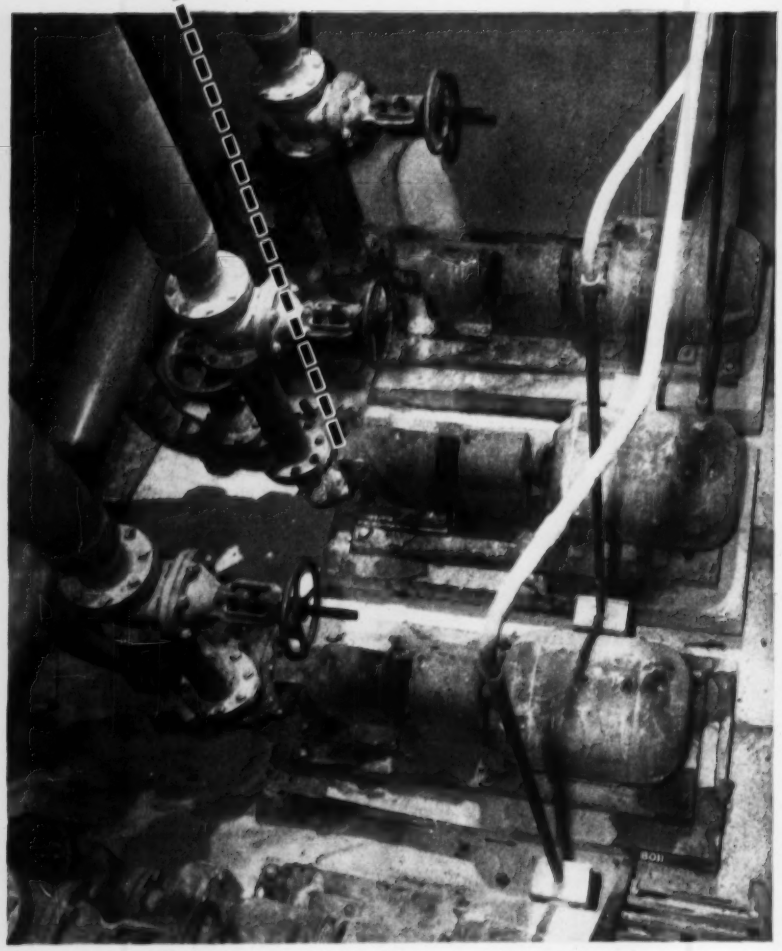
ZALLEA BROTHERS, 816 LOCUST STREET, WILMINGTON 99, DELAWARE

World's Largest Manufacturers of Expansion Joints

Sand and Ground Glass Solution

60 feet straight up

with dependable De Laval CPO Pumps



These De Laval CPO Pumps are at work 24 hours a day, 7 days a week

Here's proof of the dependability of De Laval CPO Pumps. In one large automotive company, glass grinders work 24 hours a day, 7 days a week virtually every week in the year. They cannot grind without the sand and ground glass polishing compound which must be pumped 60 feet straight up and over to a grinding room. Says the supervisor, "We have encountered no trouble at all, nor has there been any downtime for the grinders due to the pumping operation."

These pumps have cast iron casings with De Laval KK-20 (20-28 stainless) internals. This superior metal is also being used successfully on other problem fluids which require KK-20 for the casing as well.

Three bearing pedestals accommodate nine wet end sizes of the De Laval CPO, and changes in size or metallurgy can be made *after* installation with off-the-shelf parts. Either conventional or mechanical seals are available.

Write for Bulletin 1125-B

DE LAVAL *CPO Process Pumps*

DE LAVAL STEAM TURBINE COMPANY

871 Nottingham Way, Trenton 2, New Jersey

DL 3-3

There are 69 reasons why

—Diehl can build better motors. For 69 years, successive generations of Diehl motor specialists have applied their accumulated know-how to solving the power problems of widely divergent types of industries. In the smallest shops or the largest plants—all over America—Diehl men study the problem along with the customer. Name your motor requirements—no matter how "different," it's more than likely that an almost-similar situation has been recently brought to a successful conclusion with Diehl action. Here's where Diehl know-how helps you. The right answer and the right motor—*at the most reasonable cost*—can be yours, fast! Designed and built for your job. Get all the power and get it right—from Diehl.

You invest in Performance

when you design with DIEHL.

Diehl

DIEHL MANUFACTURING COMPANY

Electrical Division of THE SINGER MANUFACTURING COMPANY

Finderne Plant, Somerville, N. J.

Please send me Bulletin No. 3526 HP

Name_____

Company_____

Street_____

City_____ State_____

INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES

JENKINS Fig. 106-A

The FIRST
Renewable Composition Disc
BRONZE GLOBE VALVE
150 lbs. Steam 300 lbs. O.W.G.
⅛ in. to 3 in.

Making a Work Horse a Champion

Take a Fig. 106-A apart. It's easy to see the reason why it's the "champion" of disc-equipped Bronze Globes. Every part, from heatproof handwheel to pipe ends, reflects the design and construction skill of generations of Jenkins Valve specialists.

Jenkins Bros. introduced the first renewable composition disc Globe . . . is still the only manufacturer of both valves *and* discs.

Fig. 106-A not only looks better — it proves out better in performance. In any comparison, its long-life, low-upkeep record has always set the standard. That is the true measure of valve cost — and it is the reason why industry's shrewdest buyers will settle for nothing less than Fig. 106-A quality.

The Fig. 106-A "family", with interchangeable parts, provides Globe, Angle, and Check patterns to meet 90% of average valve needs.

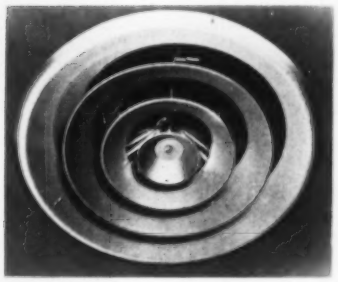
Ask your Jenkins Distributor for full information, or write: Jenkins Bros., 100 Park Ave., New York 17.

SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros

EQUIPMENT DEVELOPMENTS . . .

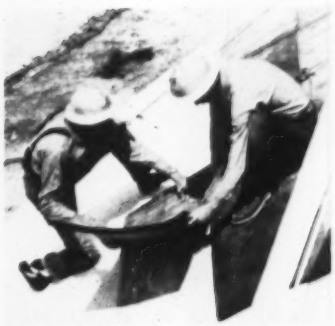
For reviews of Recent Trade Literature see Page 190



Ceiling Diffuser . . .

. . . designed to satisfy need for ceiling mounted unit with center induction feature, radial distribution—*Anemostat Corp. of America, Dept. HPAC, 10 E. 39th St., New York 16.*

"CM-I-100" available in four sizes. Operating on principle of 100 percent aspiration, unit induces, through center of diffuser, approximately 100 cfm of room air for every 100 cfm of primary air brought into unit, says company.



Insulation . . .

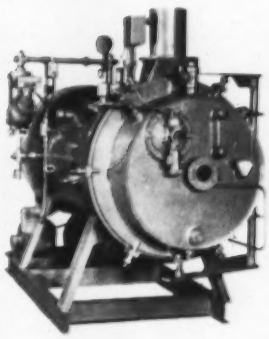
. . . with flexible foamed plastic sheet construction—*Armstrong Cork Co., Dept. HPAC, Lancaster, Pa.*

"Armaflex Sheet Insulation" formulated to adapt itself to curved or irregular surfaces with minimum of fitting, cutting. Recommended by company for large tanks, irregularly shaped vessels, oversize pipes, air conditioning and refrigeration equipment. For temperatures to 160 F. With k factor of 0.28 at 75 F. Available in thicknesses $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ in. in sheets 30 × 36 in.

Room Air Conditioner . . .

. . . with "thin" design—*Carrier Corp., Dept. HPAC, Syracuse 1, N.Y.*

New "Console Weathermaker" unit can be built into wall, or can be suspended from window sill extending only 6 in. upward into glass area, says company. Can also be installed against casement windows. Recommended installations include offices, apartments, hotels, motels. Available in $\frac{3}{4}$, 1 hp sizes.



50 Hp Packaged Boiler . . .

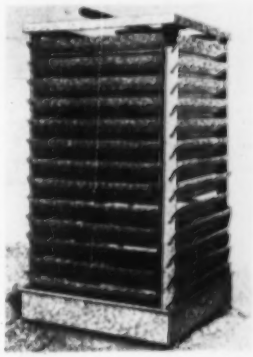
. . . for oil or gas firing—*York-Shipley, Inc., Dept. HPAC, York, Pa.*

"Wet back" does three things, says company: carries off excess heat, permitting operation at higher boiler rating; provides condensate receiver; preheats water that goes into boiler tubes. May be fired with Nos. 3, 5, 6 oil and/or manufactured or natural gas. Steam can be supplied to 125 psi.

Bimetallic Thermometer . .

. . . designed for high accuracy in temperature range —40 to 1000 F —*W. C. Dillon & Co., Inc., Dept. HPAC, P. O. Box 3003, 14620 Keswick St., Van Nuys, Calif.*

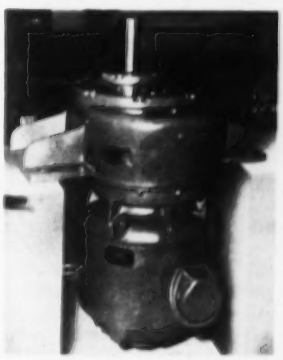
Dial diameter is 1 7/16 in. Available with plain bushing, however, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{8}$ in. NPT or $\frac{3}{8}$-24 × $\frac{1}{2}$ in. NF thread mounting nuts available optionally. Stem lengths range 2 $\frac{1}{2}$ to 70 in.



Cooling Tower . . .

. . . with packaged design for quick installation—*Dover Mfg. Co., Dept. HPAC, Box 198, Independence, Mo.*

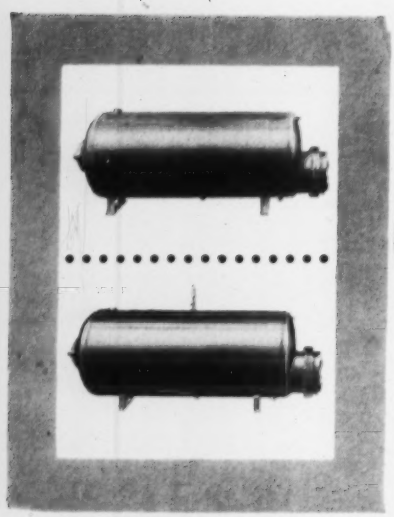
Secret of rapid field erection is fact that tower is bolt-free, says company. Tower is held together with adjustable tie rod that extends from header pipe down to center of basin. Erection procedure is to fit four galvanized corner posts into corner brackets in basin, place crown on top of posts, place header pipe into position, attach adjustable tie rod. All steel construction. Available in capacities 3 to 100 tons.



Vertical Gear-Motors . . .

. . . for cooling tower fans—*Westinghouse Electric Corp., Dept. HPAC, P.O. Box 2099, Pittsburgh 30.*

Designed to replace present systems that use separate right-angle speed reducer driven by horizontal motor through floating, flexibly coupled shaft. "Type U" units avail-

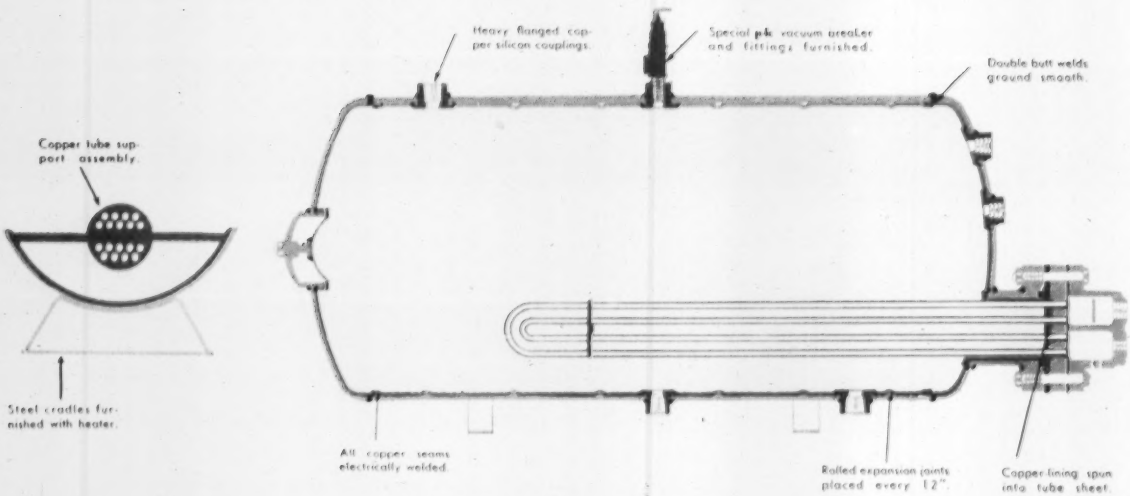


WHICH OF THESE

Copper-Lined HEATERS

WOULD YOU SPECIFY?

ONLY ONE has all these features


Heavy flanged copper silicon couplings.
Special p&k vacuum breaker and fittings furnished.
Double butt welds ground smooth.
Copper tube support assembly.
Steel cradles furnished with heater.
All copper seams electrically welded.
Rolled expansion joints placed every 12".
Copper lining spun into tube sheet.

Like twins, copper-lined heaters can look pretty much alike—on the outside. But *inside*, and on key points of construction, they can be as different as day and night.

Engineers experienced in copper-lined heaters are aware of these vital differences and specify accordingly.

They insist, for instance, on rolled joints every 12 inches around the full circumference of the lining to allow for longitudinal expansion . . . on the copper-lining being not less than 3 lb. per square foot . . . on heavy flanged copper silicon couplings, welded to both the shell and the lining . . . on enough tube supports . . . on an adequately long tube bundle with parallel "U" bends . . . and on a vacuum breaker valve to protect the lining from sudden pressure fluctuation. They make sure that separate hydrostatic and pneumatic tests are run to guarantee that linings will be leakproof.

These experts specify these details, and others, found only in P-K heaters, because they know that heaters built *without* such safeguards are false economy; but that heaters "built right," like P-K's "Indestructo" copper-lined heaters, assure trouble-free service year after year.

Like the full story? We've detailed the key construction features in sample specifications and in P-K's new Catalog 19. Ask your local P-K representative for copies or write today.

The Patterson-Kelley Co., Inc., 820 Burson Street, East Stroudsburg, Pa.

Patterson Kelley

storage water heaters • instantaneous heaters • convertors • fuel oil heaters • freon chillers and condensers

EQUIPMENT DEVELOPMENTS

Continued

able in ratings 15 to 75 hp with motor speeds 1150 and 1750 rpm.

Pressure Burners . . .

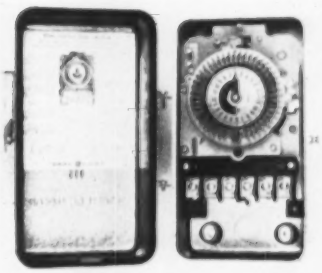
. . . designed for economically firing scotch marine type boilers, similar steam generators — *Synchronous Flame, Inc., Dept. HPAC, Walworth, Wis.*

Because of the ability to work against combustion chamber back pressure of 3 in. water or more, "Syncro/Flame" units do not require high stack, induced draft equipment, says company. In several sizes to cover range of boilers 10 to 150 hp. Three types available: gas firing, oil firing, combination.

Purifier . . .

. . . for recovery of valuable minerals, liquids vented to atmosphere—*V.D. Anderson Co., Dept. HPAC,* 1935 *W. 96th St., Cleveland* 2.

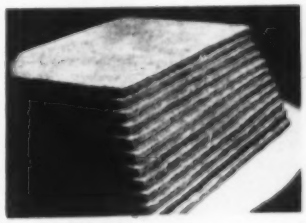
"LUS Hi-eF" units separate mist, liquids, solids of any type from any gas or vapor by series of vanes and baffles through application of principles of centrifugal force, says company. Feature of purifier is elimination of screens or filters of any type. Available in range of sizes, said to be readily adaptable to piping systems of any plant.



Time Switch . . .

. . . with "multi-tripper" dial designed for flexibility of time setting—*General Electric Co., Dept. HPAC, Schenectady* 5, *N.Y.*

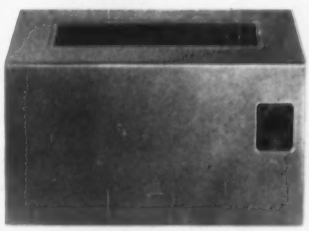
For use where many varied on-off schedules are required during 24 hr period, says company. Cited applications include heating, air conditioning, refrigeration.



Insulation Board . . .

. . . of long, fine-spun mineral fibers —*Gustin-Bacon Mfg. Co., Dept. HPAC,* 210 *W. 10th St., Kansas City* 6, *Mo.*

Recommended by company for insulation of heating, ventilating, air conditioning duct systems. Semi-rigid insulation is said to have good thermal, acoustical properties. Available in 24 × 48 in. sheets with thicknesses $\frac{3}{4}$, 1, 1 $\frac{1}{2}$, 2 in. For cooling or combination ductwork, is available with factory supplied vapor barrier.



Air Control Unit . . .

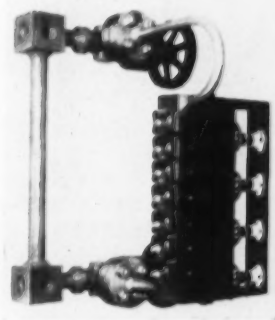
. . . for under-window, wall installations — *Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

Designed to provide practical means of air distribution where space requires high velocity air to be delivered to individual diffusers. "Uni-Flo" adjustable grille engineered for rapid diffusion, draft-free distribution of conditioned air.

Electric Unit Heaters . . .

. . . for offices, stores, industry—*Ilg Electric Ventilating Co., Dept. HPAC,* 2850 *N. Pulaski Rd., Chicago.*

Uses nonglowing, black heat type element with specially developed fan blade designed to provide even, efficient flow of heated air. Replaceable element steel covered, protected against overheating by built-in thermal cutout, says company. Normal service sizes range 1$\frac{1}{2}$ to 7$\frac{1}{2}$ kw, larger units range 9 to 15 kw.



Water Gage . . .

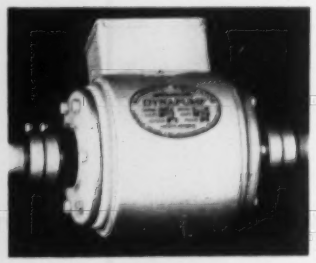
. . . designed to provide two-color readings, reduced maintenance for high pressure installations—*Yarnall-Waring Co., Dept. HPAC, Mermaid Ln., Philadelphia* 18.

"Color-Port" units recommended by company for high pressure boilers to 3300 psi. In port type openings, water shows green, steam shows red. Thus, full gage is all green, empty gage is all red. Individual cover glass

EQUIPMENT DEVELOPMENTS

Continued

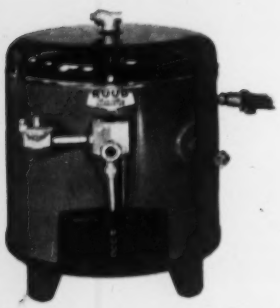
assemblies are said to permit quick, easy servicing of gage in place, without removal from boiler.



Water Circulator . . .

. . . with "extra wide" head rating—*Fostoria Pressed Steel Corp., Dept. HPAC, Fostoria, Ohio.*

"Dynapump" features 24 ft head which should produce flow rate twice as great as standard duty circulators, result in improved baseboard performance with half as much temperature drop, says company. Unit magnetically driven. Pump, motor wholly enclosed.



Gas Water Heater . . .

. . . for under-the-counter or wall mounted installations in commercial establishments—*Ruud Mfg. Co., Dept. HPAC, Kalamazoo, Mich.*

Designed to have small physical dimensions, high Btu input. Rated 95,200 Btu per hr on all gases. Approved by AGA as instantaneous water heater, as circulating tank water heater, says company. Recommended by manufacturer for installation in barber and beauty shops, service stations and garages, restaurants, supermarkets, plus motels and apartment buildings.

Solenoid Valves . . .

. . . with multi-voltage coil—*Jackes-Evans Mfg. Co., Dept. HPAC, 1427 Geraldine Ave., St. Louis 15.*

Flow control of water, air, light oils, fluorinated hydrocarbon refrigerants Nos. 12 and 22, (liquid, hot gas, suction) brine, industrial gas, 5 lb steam, etc., through 42 different valve styles and capacities, and with any one of seven electrical circuits (115/25, 115/50 and 60, 208/50 and 60, 230/50 and 60), now available through use of new multi-use coil, says company. Valves range 7/64 to 1 1/2 in. port sizes, are suitable for temperatures to 225 F.

Priming Solution . . .

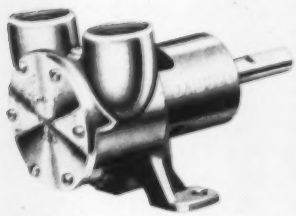
. . . for use with company's coal tar protective coatings—*Tapecoat Co., Dept. HPAC, 1523 Lyons St., Evanston, Ill.*

"TC Primecoat" formulated to provide primer compatible with coal-tar-pitch used. Available in 1 gal cans, two cans to the carton. Application coverage is 400 sq ft per gal.

Hanging Devices . . .

. . . for copper tubing—*Paine Co., Dept. HPAC, Fullerton Ave. and Westgate Rd., Addison, Ill.*

In three types: Two-hole straps are designed to have no sharp corners, edges; are available in seven sizes. Coppered wire hooks have two sharp drive points fabricated with offset bend engineered for easy hammering; are preformed to provide pressure fit around tubing to minimize vibration; are available in nine standard sizes (other sizes on special order). Copper plated hanger iron has holes spaced on 1/2 in. centers that take 1/4 in. bolts; is available in 100 and 10 ft coils, in 3/4-20 or 3/4-24 gage.



Pumps . . .

. . . with vertical port, self priming design—*Jabsco Pump Co., Dept. HPAC, 2031 N. Lincoln St., Burbank, Calif.*

In port sizes 3/8, 1/2, 3/4, 1 in. Engineered for high or low speed operation with pulley or direct motor drive. Equipped with ball bearings sealed, lubricated for long life, says company. Recommended by manufacturer for general transfer applications.

Testing Kit . . .

. . . providing complete set of instruments for testing, adjusting gas burners in accordance with AGA standards, municipal ordinances—*Bacharach Industrial Instrument Co., Dept. HPAC, 7301 Penn Ave., Pittsburgh.*

Includes CO_2 indicator, stack thermometer, draft gage, neutral pres-

Fit-up is Fast, Easy and Permanent with B&W CROLOY Elbows

THIS end-use required welding fittings resistant to heat and corrosion—*plus* economical fabrication. B&W CROLOY 5 was chosen to meet service requirements. Dimensional accuracy and uniformly beveled ends of B&W Elbows simplified the welding procedure.

CROLOY 5 is one of a complete series of chromium molybdenum alloy steels developed by B&W to meet varying conditions of corrosion and oxidation in elevated pressure service. Further information on CROLOY 5 is available in B&W Bulletin 146.

B&W Alloy Welding Fittings and Flanges reduce fabricating time because they provide positive alignment at joints and are quick and easy to weld. B&W Bulletin 502 gives complete information.

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION • FITTINGS DEPARTMENT
3839 WEST BURNHAM STREET • MILWAUKEE 46, WISCONSIN

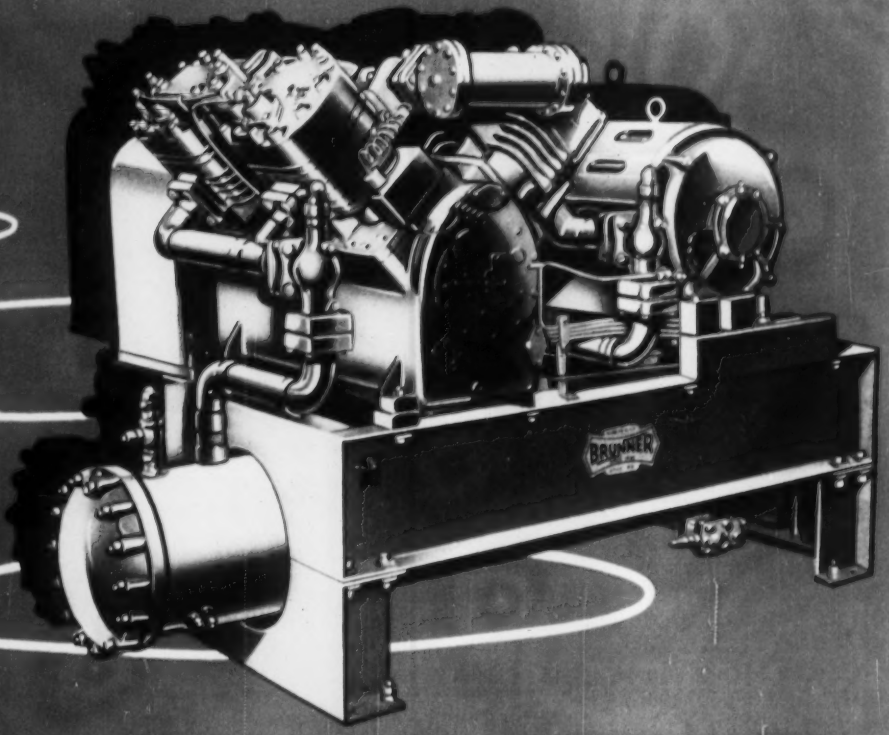
FA 6916

Seamless welding fittings and flanges, seamless and welded tubular products — in carbon, alloy and stainless steels

1906

Engineered for entertainment, the stereoscope . . . popular in 1906 . . . was the forerunner of modern 3-D photography. It was in 1906 that the first *Brunner-engineered* product was built.

TODAY **Brunner engineering offers the most complete line of Air Conditioning Condensing Units available from a single source.**



Whether the job be large or small, there's a *right* Brunner Condensing Unit for every remote Air Conditioning application. Complete size range from ¼ H.P. through 100 H.P. Self-contained BAC units in 3, 5, 7½ and 10 H.P. models.

ALSO AVAILABLE

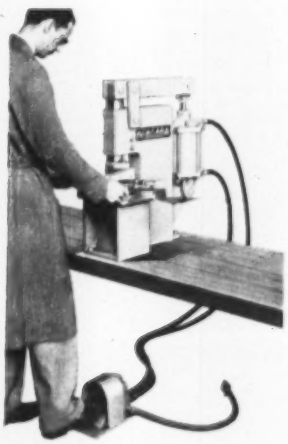
AIR-COOLED CONDENSING UNIT FOR OUTDOOR INSTALLATION —in 2-, 3- and 5-ton capacities, with protective shelter.

PROVEN QUALITY
50th Anniversary
BRUNNER
SINCE 1906
DEPENDABLE

BRUNNER MANUFACTURING COMPANY, UTICA, N.Y.

The Brunner Co., Gainesville, Ga. In Canada: Brunner Corp. (Canada) Ltd., Toronto, Ontario

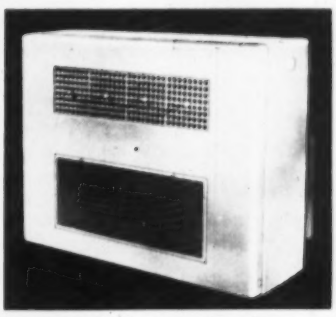
sure point indicator, gas pressure gage, oxygen indicator, carbon monoxide detector. Packed in instrument-type, metal carrying case.



Notcher, Punching . . .

. . . machine designed to streamline operations in sheet metal shops, metal working plants—*Niagara Machine & Tool Works, Dept. HPAC, 683 Northland Ave., Buffalo.*

Air power unit has 6½ ton capacity, 4¾ in. throat. Can be equipped with selection of punches, dies for simple or intricate holes, corner trimming or combination trimming, cutoff, says company. Foot valve frees hands for locating, feeding material.

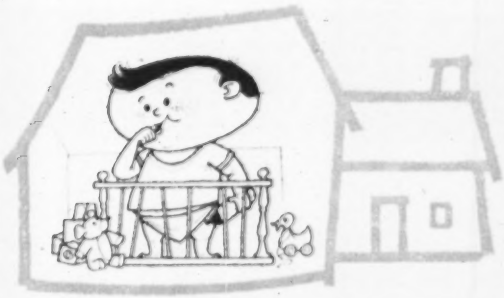


Air Conditioning . . .

. . . system for peripheral heating, cooling of office buildings, hotels, apartment houses, hospitals, etc.—*Remington Corp., Dept. HPAC, Auburn, N. Y.*

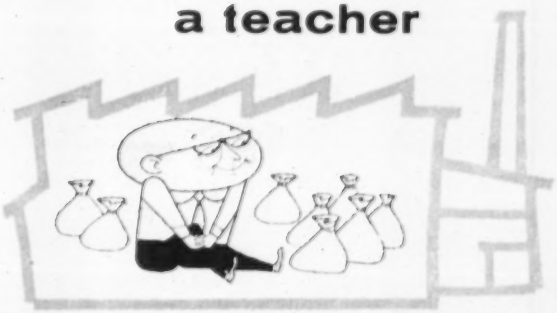
Outdoor air for cooling is picked up from under each window. While

for heating—



a toddler

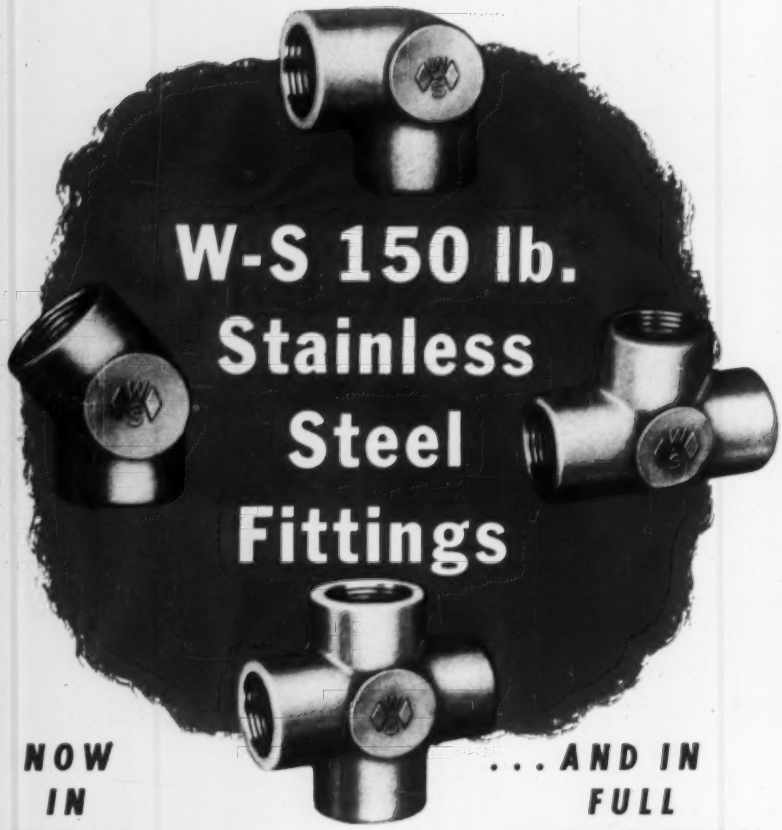
a teacher



a tycoon

. . . there's a Ray burner for the job. And, whatever fuel you're going to use—gas, oil or both, there's an efficient, automatic Ray burner to give you consistent performance year after year. No matter what the assignment—residential, commercial or industrial buildings, Ray has a burner designed to fit the job's needs. Our complete line of combustion equipment, combined with our world-wide network of dealers for on-time installation and service, are two big reasons why Ray is the world leader in burners. Why not contact your Ray dealer, or write us direct for complete information.

RAY BURNER CO.
1301 San Jose Avenue, San Francisco, California
629 Grove Street, Jersey City, New Jersey



NOW IN STOCK . . . **. . . AND IN FULL PRODUCTION**

New production machinery and techniques developed at W-S Fittings Division now assure you of prompt deliveries on corrosion resistant stainless steel pipe fittings. Your local W-S stainless steel distributor will be glad to fill your order from his stock.

W-S 150 lb stainless steel fittings, types 304 and 316, resist a wide variety of corrosive services in petroleum, chemical, petrochemical, food and other process industries. They are also ideal for many low temperature operations because of their inherent toughness at sub-zero conditions. W-S 150 lb fittings can be obtained in sizes ⅜" to 4" in either screwend or socket-welding types to meet your needs.

For detailed technical information on our 150 lb line, send today for Bulletin S-3-55. For prompt price and delivery information call your nearest W-S distributor.

W-S FITTINGS DIVISION

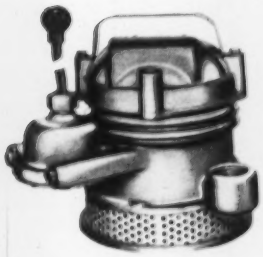
H.K. PORTER COMPANY, INC.

Roselle, New Jersey

EQUIPMENT DEVELOPMENTS

Continued

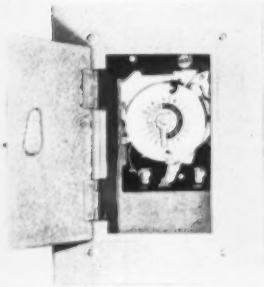
cooling is decentralized to each individual unit of system, heating makes use of central hot water or steam system. Both heating, cooling under one set of controls.



Submersible Pump . . .

. . . with 1/3 hp capacitor motor, automatic pressure type control switch —*Weil Pump Co., Dept. HPAC, 1530 N. Fremont St., Chicago 22.*

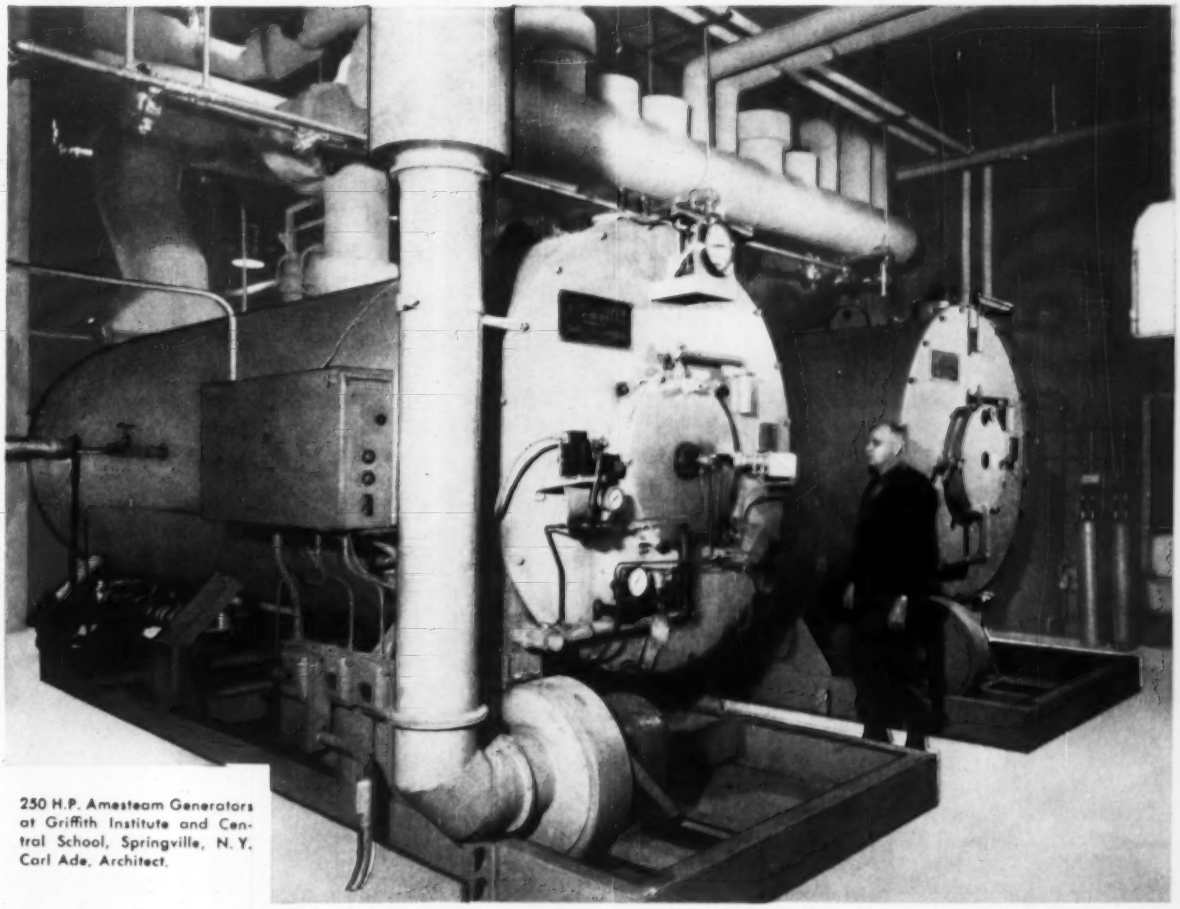
Designed to operate completely submerged with hermetically sealed motor. Discharge is 1¼ in. with discharge heads to 24 ft, capacities to 3600 gph. Furnished with 8 ft power cable, including grounded plug.



Flush Mounted Case . . .

. . . for housing several series of "Intermatic" time switches—*International Register Co., Dept. HPAC, 2620 W. Washington Blvd., Chicago.*

Recommended by company for when all enclosures, wiring are to be concealed in wall. Available for use with "T560" standard on-off switches, "T566 Skipper" series which permits operation on selected days, "T670" series for short interval timings 5 to 60 min.



250 H.P. Amesteam Generators at Griffith Institute and Central School, Springville, N. Y. Carl Ade, Architect.

ANOTHER FINE SCHOOL REPORTS SATISFACTION WITH

AMESTEAM GENERATOR

The beautiful new Junior-Senior High School above represents the finest functional educational design in the distinguished 126-year history of Griffith Institute at Springville, N.Y. Thoroughly in keeping with the modern facilities are the two 250 h.p. Amesteam Generators. These fully automatic "package" boilers, installed as complete units without complicated on-the-job assembly work, require a minimum of space.

Writes Principal Charles Knapp:

"Now that the two Amesteam Generators have been in operation in supplying heat for the new Junior-Senior High School building at Griffith Institute and Central School, I should like to tell you how pleased we are with them.

We find them much cleaner, of course, and we are also well pleased with their very dependable and economical performance. As you know, we still have coal-fired boilers in the older buildings, so we have a chance to make a direct comparison. I can assure you that whenever these coal-fired units need replacing, our first consideration will be Amesteam Generators."

Letters like this tell us of the satisfaction with Amesteam Generators in institutions, plants and public buildings throughout the country. In fact, an Amesteam Generator on the job is our best salesman! If *you* want the economical, dependable operation possible only with a quality boiler, mail the coupon below.

AMES IRON WORKS INC.
BOX D-126 OSWEGO, N. Y.

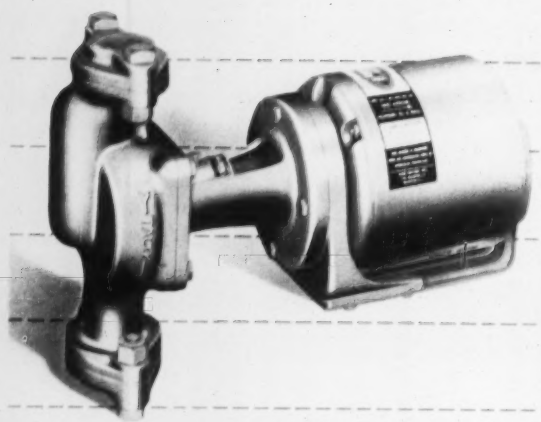
AMES IRON WORKS, INC.
BOX D-126, OSWEGO, N. Y.

Please send me engineering details on AMESTEAM GENERATORS and name of nearest AMES representative.

NAME .....

COMPANY .....

ADDRESS .....



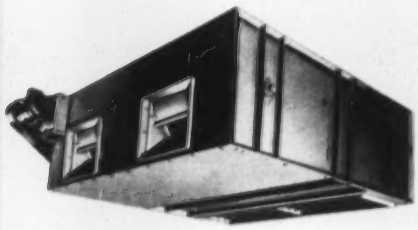
One circulator
stands alone
for quality,
performance,
dependability

BETTER HEATING
Taco
BETTER WITH TACO

TACO HEATERS, INCORPORATED
1160 Cranston Street • Cranston 9, R. I.

For full information on the complete Taco line of circulators write for Technical Data Sheet TDS5

EQUIPMENT DEVELOPMENTS *Continued*



Heating, Ventilating Unit . . .

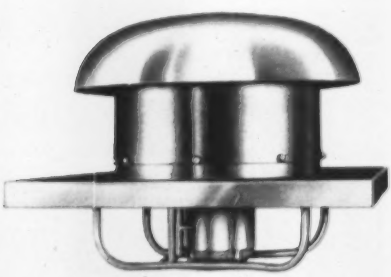
. . . for large buildings which require ventilation with heating, such as auditoriums, theaters, garages, industrial plants — *Trane Co., Dept. HPAC, La Crosse, Wis.*

Cited feature is "sectionalized" design. Nine unit combinations offered in "Torrivent" line, ranging from basic model supplying untempered make-up air to deluxe model that provides heating, ventilating, humidification, says company. Capacities range 1150 to 36,000 cfm of air, 50,000 to 1,900,000 Btu. Shown is horizontal ceiling model.

Door Grille . . .

. . . featuring telescoping frame which provides 1 in. flange for both sides of door — *Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

For doors ranging 1 3/8 to 2 in. thick. Two cores available: one, said to be visionproof from any angle, has 31.5 percent free area; other has 36.6 percent free area. Several finishes available.



Axial Mushroom Power Exhauster . . .

. . . with low silhouette design—*Chicago Blower Corp., Dept. HPAC, 9863 Pacific Ave., Franklin Park, Ill.*

Mushroom shaped unit is said to have overall height less than 18 in. For either air intake or exhaust. Aero-

Many extra advantages at no extra cost with this low-pressure pipe covering

Insulating efficiency of ½" thick Armaglas* Low-Pressure Covering is equal to or better than ¾" or 1" thickness of ordinary materials. Lightweight, thin wall design speeds handling and saves space in crowded quarters. Tough glass fiber composition eliminates cracking and crumbling during application. High shrinkage resistance keeps joints tight and neat looking. White vapor barrier jacket needs no further finishing on cold water, hot water, or low-pressure steam lines. Made in molded half sections for pipe and tubing to 12".

Armaglas is one of the quality products in the complete line of Armstrong Industrial Insulations. Armstrong also offers you a complete contracting service, geared to install these products economically and efficiently.

For complete information on Armaglas, send for free booklet. Booklets on other Armstrong Insulations also supplied on request. Check the ones you want on the coupon below.

* Trade Mark. Manufactured for Armstrong by Owens-Corning Fiberglas Corp.

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☐ Armstrong Armaglas Insulations for Pipes, Tanks, and Vessels

☐ Armstrong Insulcolor®, Weatherproof Coating in Eight Colors

☐ Armstrong LT Cork Covering, a New Type Cold Line Insulation

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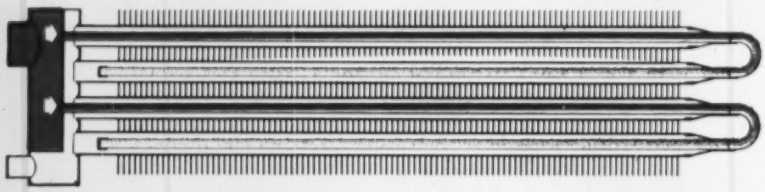
Nesbitt Series T Surface
assures uniform discharge temperatures

If a coil will not deliver uniform temperature across its full length under modulated steam supply, you can expect uneven heating from the ducts. The only positive cure for this problem is to install Nesbitt Series T Surface with Trombone Steam Distributing Tubes.

Unlike conventional surface, Nesbitt Series T Surface employs the exclusive Trombone distributing tubes, each of which serves two adjacent condensing tubes from a single supply connection. Steam must travel across the first leg of the trombone tube (the full length of the surface) before reversing, under increased demand, to serve the second leg. Results: uniform discharge temperatures; maximum freeze protection; perfect controllability.

Nesbitt Series T Surface with Trombone Steam Distributing Tubes



Nesbitt HEATING SURFACE

WITH THE TROMBONE STEAM DISTRIBUTING TUBES

Made and sold by John J. Nesbitt, Inc., Phila. 36, Pa. Ask for Publication 305

EQUIPMENT DEVELOPMENTS

Continued

dynamically designed guide vanes combined with airfoil blades offer increased air moving efficiency with less noise, turbulence, says company. Blade diameters range 9 to 48 in. For exhausting 350 to 34,430 cfm of fumes, smoke, dust.

Solenoid Valve . . .

. . . with independent controls for manual opening, adjustment of flow, opening and closing speed—*J. D. Gould Co., Dept. HPAC, 4707 Massachusetts Ave., Indianapolis* 18.

"Type HV" unit can be mounted on piping running at any angle, says company. Recommended by manufacturer for variety of general service applications. In standard sizes ½ to 2 in. Maximum capacity is 300 psi.

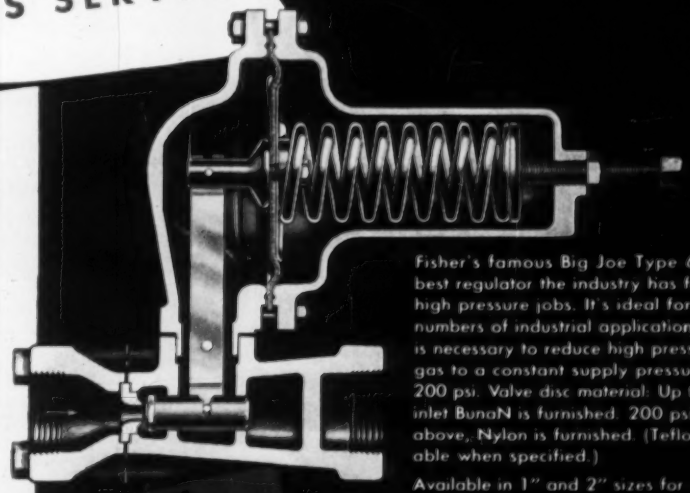
Cutoff Switch . . .

. . . for water system protection—*Furnas Electric Co., Dept. HPAC, 1000 McKee St., Batavia, Ill.*

"Gard-it" stops pump operation when water pressure falls below safe, predetermined operating level, says company. Pumps, water cooled motors protected when water level in well drops below intake of drop pipe, operating pressure falls to cutoff point. Rated 1 hp, 110-220 volts, a-c. Actuated by operating pressure from pump.

1st Choice FOR POUNDS TO POUNDS SERVICE

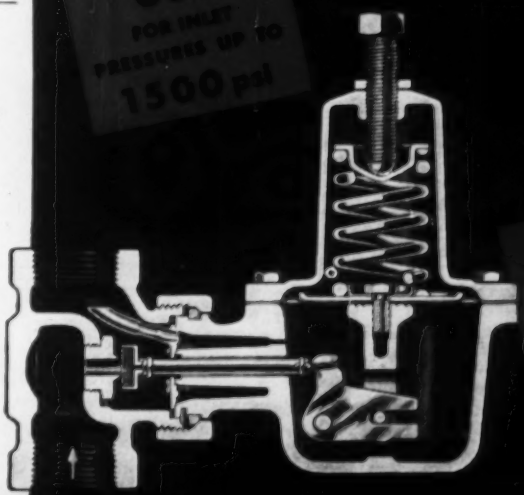
FISHER®



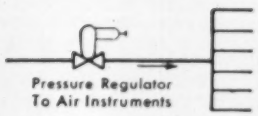
Fisher's famous Big Joe Type 630 is the best regulator the industry has for rugged high pressure jobs. It's ideal for countless numbers of industrial applications where it is necessary to reduce high pressure air or gas to a constant supply pressure of 5 to 200 psi. Valve disc material: Up to 200 psi inlet BunaN is furnished. 200 psi inlet and above, Nylon is furnished. (Teflon is available when specified.)

Available in 1" and 2" sizes for inlet pressures up to 1500 psi and outlet pressures 5 psi to 200 psi.

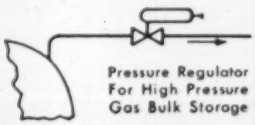
TYPE 630 FOR INLET PRESSURES UP TO 1500 psi



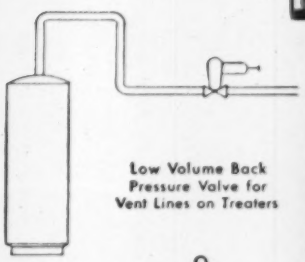
TYPE 620 FOR INLET PRESSURES UP TO 750 psi



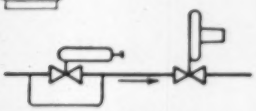
Pressure Regulator To Air Instruments



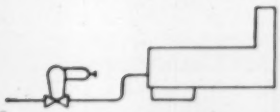
Pressure Regulator For High Pressure Gas Bulk Storage



Low Volume Back Pressure Valve for Vent Lines on Treaters



Pressure Regulator For Farm Tap Service



Reducing Valve for Heater Fuel or Treater Furnace Fuel

For real economy the Fisher Type 620 pounds to pounds regulator is used on same applications as 630 "Big Joe" where pressure and flow requirements do not exceed 750 psi and reduced pressure not above 100 psi.

For inlet pressures up to 750 psi with malleable iron or cast steel body, up to 150 psi with cast iron body. Outlet pressure ranges: Type 620—3 to 60 lbs. (4 springs). Type 621—3 to 100 lbs. (5 springs). Valve disc material: BunaN when inlet pressure is 300 psi or less, and Nylon when inlet pressure exceeds 300 psi.

Sizes: ¼", 1" and 1¼" with cast iron or cast steel body. ¼" and 1" with malleable iron body.

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MARSHALLTOWN, IOWA
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LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

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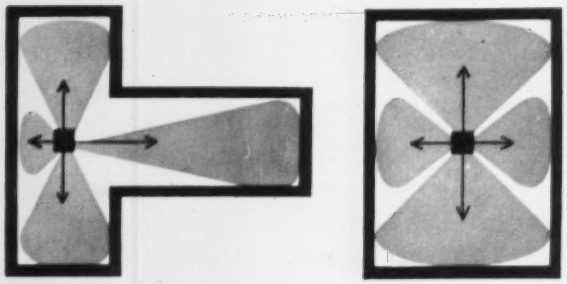
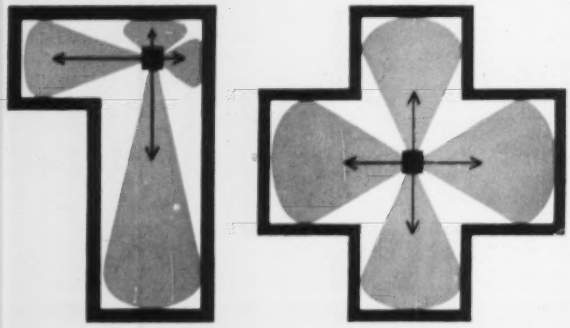
Since 1880

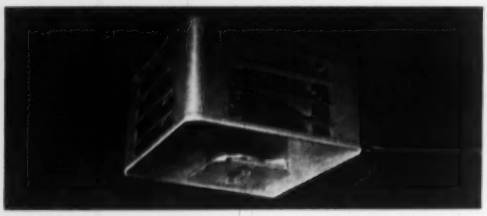
You can heat



any of these areas



with one Carrier "Clover Leaf"



Just one of Carrier's exclusive "Clover Leaf" Unit Heaters with variable 4-way air distribution effectively heats up to 8000 square feet of floor area. Carrier's greater, more flexible coverage means fewer units are needed, resulting in impressive savings in first cost, installation and upkeep. For steam or hot water, in 8 sizes: 55,000 to 600,000 Btu/hr.

For a complete "Clover Leaf" catalog, call your Carrier manufacturer's agent. See Classified Telephone Book under "Heaters—Unit." Or write Carrier Corporation, Department UH, Syracuse, New York.

Complete Line of Unit Heaters. With over 50 years' leadership in temperature control, Carrier knows heating.

Carrier

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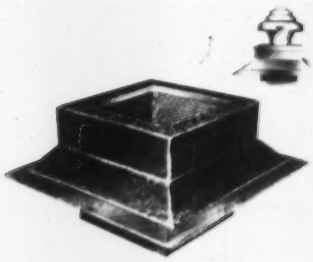
EQUIPMENT DEVELOPMENTS

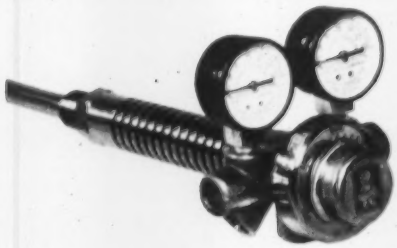
Continued



Acoustical Insulated Curb . . .

. . . designed to control fan noises—*Penn Ventilator Co., Dept. HPAC, 3252 Goodman, Philadelphia, 40.*

"Sonotrol Curb" engineered to help reduce noises at source where build-up is developed by any roof fan. Is said to blanket, absorb large percentage of noise. Provides support, housing for motor and gravity operated dampers, in addition to noise reduction feature.



Thermostatic Controller . . .

. . . for high temperature applications—*Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Dept. HPAC, Box 400, Knoxville, Tenn.*

Available in standard temperature ranges 250 to 450 F, 350 to 550 F. However, can supply any 200 deg range 50 to 600 F, says company. Recommended by manufacturer for where compressed air is used as pilot supply.

Remote Room Air Conditioners . . .

. . . with new fan-coil units added to line — *Brown Products Corp., Dept. HPAC, 97-12 Metropolitan Ave., Forest Hills, N.Y.*

Line now has models for every type of installation, says company. Includes units without cabinets for where recessing is desired, models in specially designed cabinets to blend with room decor, units of compact design for overhead installation.

Sulphur, Iron Removal Filters . . .

. . . for commercial applications—*Bruner Corp., Dept. HPAC, 4763 N. 32nd St., Milwaukee 9.*

Recommended by company to remove sulphur, iron from water supplies, are equipped with "Fer" mineral.

THE MARK OF QUALITY

BARBER COLMAN

ELECTRIC-ELECTRONIC

Automatic Controls

Why electronic control?

. . . Barber-Colman's ultra-sensitive MICRORELAY contributes to dependable system control

(an exclusive Barber-Colman development for modern aircraft marks major advance in electronic air conditioning control systems)

SENSING ELEMENT . . . simple coils of temperature-sensitive wire are equally effective at any distance from electronic panel—dustproof, tamperproof, foolproof.

PLUG-IN TYPE . . . relay and tubes for simplified installation, easier servicing. MICRORELAY operates in any position, has aircraft-proved reliability.

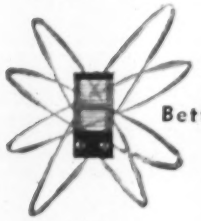
ONLY 2 TUBES NEEDED . . . less chance of tube failure, smaller inventory of tubes. No shifting of control point due to aging of tubes, or line voltage fluctuations.

1000 TIMES LESS ACTUATING POWER REQUIRED . . . extreme relay sensitivity substantially reduces amplification required. Fewer tubes operated at low plate voltage prolong tube life.

No other system approaches the speed and flexibility of Barber-Colman electronic temperature controls in detecting and compensating for load changes affecting the control system . . . gives dependably *stabilized* discharge temperature.

Because of minute power requirements of the exclusive MICRORELAY, you get all of the advantages outlined above, and avoid troubles with overloaded tubes and balance adjustments to compensate for capacitance in lead wires.

Get all the facts on this advanced type of control system . . . including "Control Center" operation where building engineers alone make easy dial settings for all desired multi-person areas.



Better control . . . *electronically!*

For the complete story on how Barber-Colman Electric-Electronic Control Systems can help you solve your control problems, contact your nearby Barber-Colman Field Office.

Barber-Colman Company

DEPT. L, 1301 ROCK ST., ROCKFORD, ILLINOIS, U. S. A.

Is your plant ready for cold weather?

Steam lines and process equipment equipped with Yarway Impulse Steam Traps *are* prepared for winter:

. . . protected against freeze-ups.

. . . capable of operating at high even temperatures.

. . . ready for peak production loads.

The little valve of the Yarway Impulse Steam Trap (only moving part) continually tests for condensate, discharges each bit as it forms, prevents freezing.

Combined with other important Yarway features—fast equipment heat-up, stainless steel construction, small size, light weight, good for all pressures without adjustment, low initial cost—this adds up to *the best winter trapping you can buy.*

Check your traps now. Then call the Yarway distributor for the Impulse Traps you need. 270 of these distributors, one near you. We'll gladly send you his name also the latest Yarway Steam Trap Bulletin. Write to . . .

YARNALL-WARING COMPANY
107 Mermaid Avenue, Philadelphia 18, Penna.

YARWAY

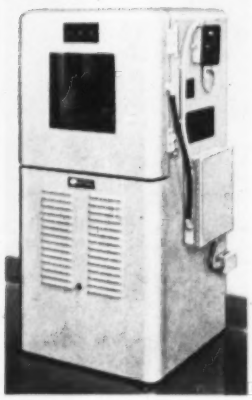
impulse® steam trap

The Impulse that revolutionized steam trapping 20 years ago.

EQUIPMENT DEVELOPMENTS

Continued

In 20, 24, 30 in. diameter gate valve models. With built-in ejector for potassium permanganate regeneration. Cited feature of units is automatic backwash control that prevents mineral loss.



Chilling Machine . . .

. . . with 4 cu ft chamber—*Cincinnati Sub-Zero Products, Dept. HPAC, 3930 Reading Rd., Cincinnati 29.*

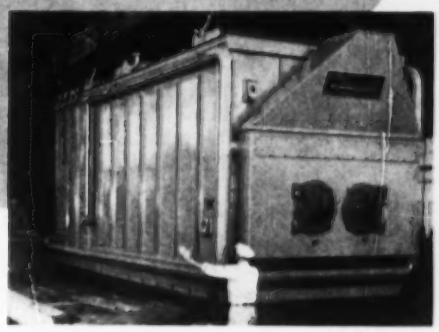
Low temperature unit designed for laboratory testing in regard to quality control, product development uses. Has net thermal capacity of approximately 600 Btu per hr at −120 F, with temperature selection −80 to −120 F, and full range pull down in 15 min, says company.

A-C Arc Welder . . .

. . . for operation on single phase, 60 cycles, 230 volts input—*Hobart Bros. Co., Dept. HPAC, Troy, Ohio.*

New, triple rated, transformer

The Swing is to *International-LaMont* for HIGH TEMPERATURE WATER GENERATION



One of (2) 40,000,000 Btu./Hr. packaged HTW Generators being loaded for shipment to Johnson & Johnson, New Brunswick, N.J.

. . . Over 20 Installations to date,

including industrial, government, institutional and air terminal projects. Here is proof of the unequalled acceptance of International-LaMont Forced Recirculation Generators for the most efficient, lowest cost high temperature water for large area heating, power and process requirements—with these exclusive advantages:

- **NO THERMAL SHOCK** — System return water is circulated through the Built-In Economizer and brought close to saturated temperature by flue gases BEFORE reaching the radiant furnace zone.
- **BUILT-IN ECONOMIZER** permits safe use of maximum available temperature differential between boiler outlet and system return water. Temperature differentials from 175°F. to 200°F. are possible and recommended. Result: lower original equipment and operating costs.
- **LOW HEADROOM BOILER.** Minimum height reduces cost of boiler house construction . . . permits installation in many existing structures.
- **COMPLETE RANGE OF SIZES** from 2 to 200 million Btu per hour or larger . . . design pressures to 500 psi with corresponding temperatures. Pressurized furnace or induced draft operation. Individual boiler circulating pumps or combined pump system if preferred.

Get the Facts. Write for Bulletin 700 today.

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Steel Firebox Heating & Power Boilers • Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

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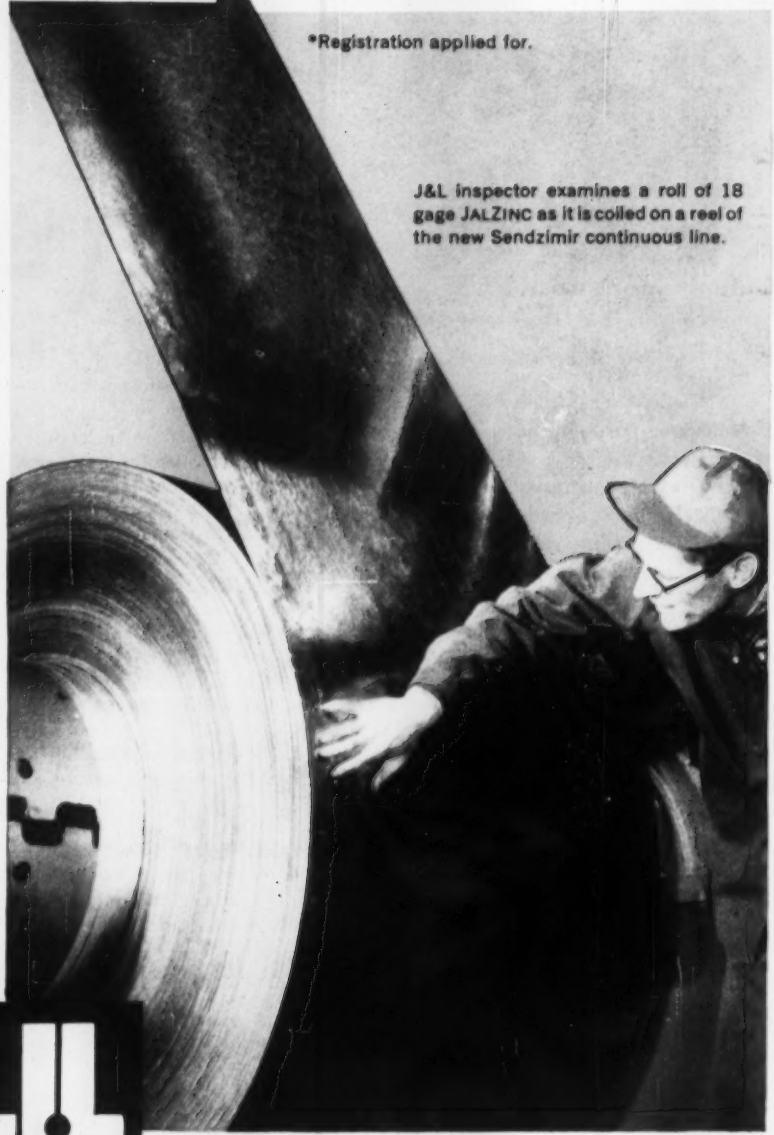
JALZINC*

*Registration applied for.

JALZINC is Jones & Laughlin's new trade name for its *high quality* zinc coated steel sheet and coiled product. JALZINC answers your toughest forming, rolling and drawing problems.

Produced by the proven Sendzimir process, JALZINC has a tight, uniform coating that resists cracking and flaking. The high lustre finish greatly improves the appearance of your end product. JALZINC is available in a wide range of gages and widths in both cut lengths and coils.

Users are enthusiastic about JALZINC'S uniform ductility, flatness and surface finish. Write today for complete details.



J&L inspector examines a roll of 18 gage JALZINC as it is coiled on a reel of the new Sendzimir continuous line.

Jones & Laughlin Steel Corporation
Dept. 511, 3 Gateway Center
Pittsburgh 30, Pa.

☐ Please send literature on JALZINC
☐ Please have J&L representative call

Name _____

Position _____

Company _____

Address _____

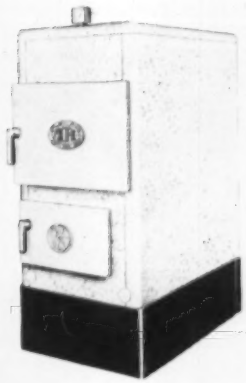
City _____ Zone _____

State _____

J&L STEEL

Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

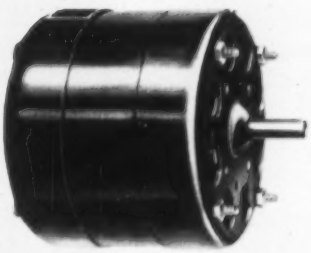
type unit has following outputs at 30 volts: 295 amps on 20 percent duty cycle; 250 amps on 30 percent duty cycle; 200 amps on 50 percent duty cycle. Transformer is "Diverter Path" type with magnetic control designed for high efficiency, safety, silent operation.



Boilers . . .

. . . for small commercial installations —*Pacific Steel Boiler Div., National-U.S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

With two-pass design that divides flowing hot gases into 50 baffled tubes. Available with or without jacket. With net SBI steam ratings 1100 to 5000 sq ft., net SBI water ratings 297,000 to 1,350,000 Btu per hr.

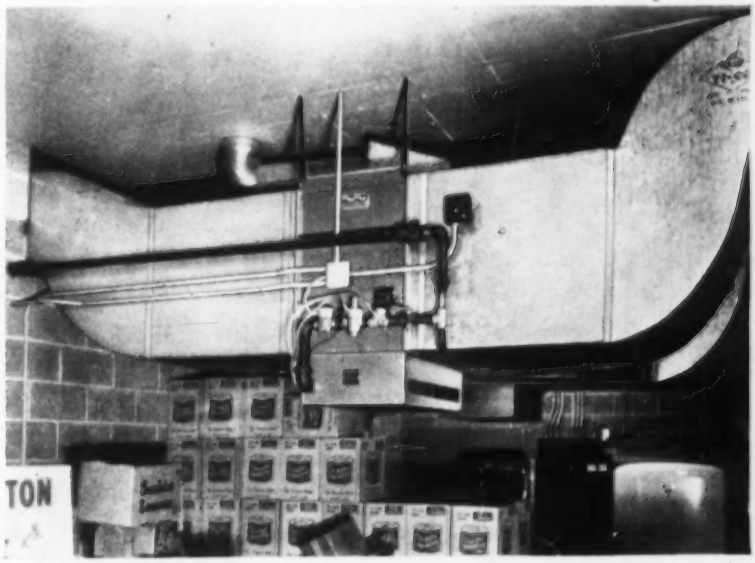


FHp Motors . . .

. . . for use in unit heaters, air conditioning units, fans—*Fasco Industries, Inc., Dept. HPAC, P.O. Box 509, Rochester 2, N.Y.*

Four-pole, shaded pole units available in ratings 1/25 to 1/10 hp. Have unique pole configuration said to

Corrosion-free *year-round*



Modine STAINLESS STEEL
Gas-Fired Duct Furnace

UNMATCHED for central and "booster" heating and ventilating—the Modine Gas-Fired Duct Furnace is ideal for use with cooling coils and packaged air conditioners. Rust-resistant stainless steel burners and heat exchangers eliminate problems of corrosion encountered with conventional units. Five sizes—88,000 to 213,000 Btu/hr input.

Only Modine gives all these advantages

Longer service life — Stainless steel construction resists rust, scale, moisture . . . cuts maintenance . . . expands application possibilities.

Faster heat transfer — Seam-welded, gas-tight heat exchanger and direct-fired tubes give instant heat.

Self-cleaning burners — Large, knife-sharp ports have four times the area of drilled ports . . . prevent lodging of dirt and scale. Burner unit can be removed for inspection, service.

Easy access—All controls are mounted on side of unit for easy inspection and service, regardless of furnace location. Airflow is reversible, permitting side-by-side installation.

Lightweight — Stainless steel construction reduces weight . . . units handle easily, cost less to install.

Varied applications — Ideal as central heaters . . . boosters . . . with air conditioners . . . and for industrial and agricultural drying . . . processing . . . and ventilating.

For facts, see the Modine representative listed in your classified phone book or write Modine Mfg Co., 1509 DeKoven Ave., Racine, Wis., for Bulletin 855.

Modine GAS-FIRED STAINLESS STEEL DUCT FURNACES

D-1312

SOLENOID VALVES
Simplify Valve Selection
Reduce Inventory and Parts Stock

You can use *the same* J-E Solenoid Valve to control the flow of *any* of the above fluids, as well as air, brines, light oils, industrial gas, etc. In addition, one size coil (in a variety of voltages) and one plunger fit all valves regardless of size or capacity.

This versatility saves valuable time and trouble in selecting the proper valve for a wide variety of applications. Their unique "all purpose" design also saves important money by greatly reducing inventory and parts stock.

It will pay you to find out about *all* the advantages of J-E Solenoid Valves including . . . simple installation . . . dependable performance . . . quiet operation . . . easy maintenance. Then you'll know why they are being used with enthusiasm and satisfaction in hundreds of applications where other solenoid valves have failed.

Call your wholesaler or write direct today:

J-E *Controls Division*
JACKES-EVANS MANUFACTURING CO.
4427 Geraldine Avenue • St. Louis 15, Missouri

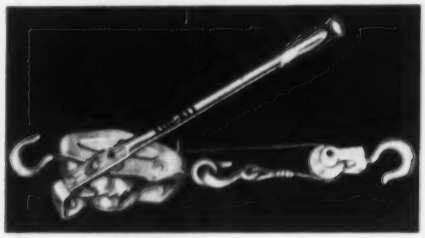
EQUIPMENT DEVELOPMENTS *Continued*

produce better flux distribution resulting in higher efficiencies, better power factors.

Tubing, Lined Steel Pipe . . .

. . . of tetrafluoroethylene resin—*Haveg Industries, Inc., Dept. HPAC, 900 Greenbank Rd., Wilmington 8, Del.*

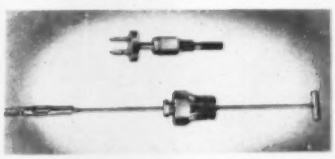
•Tubing in sizes to 4 in. diameter, lined pipe in 2 in. sizes. Also available in rods, special machine parts.



Ratchet Lever Hoist . . .

. . . with standard lift of 30 ft—*Lug-All Co., Dept. HPAC, 355 Lancaster Ave., Haverford, Pa.*

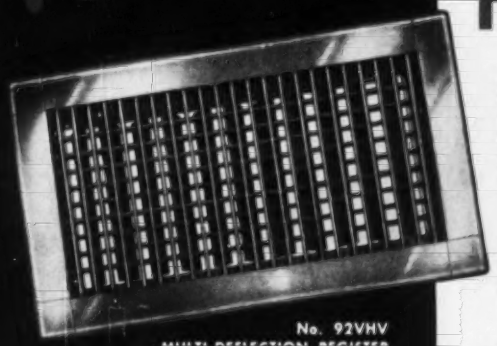
"Model 3000-30" weighs 13¾ lb, includes flexible aircraft cable for lifting, pulling, lowering 1½ ton load 15 ft or ¾ ton load 30 ft. Cited features: rugged, protective type main frame of aluminum alloys; oiled-for-life bearings; stainless steel springs; three workable hooks; smooth operation in any position; built-in pulley that can be used as "snatch block" in close quarter work.



Miniature Shielded Thermocouples . . .

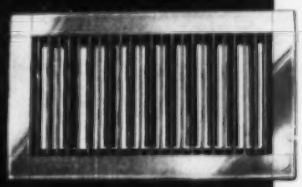
. . . for temperature measurement of gases, and vapor mixtures of gases, liquid in gas turbines, pumps, pipelines, similar applications—*Thermo Electric Co., Inc., Dept. HPAC, Saddle Brook, N.J.*

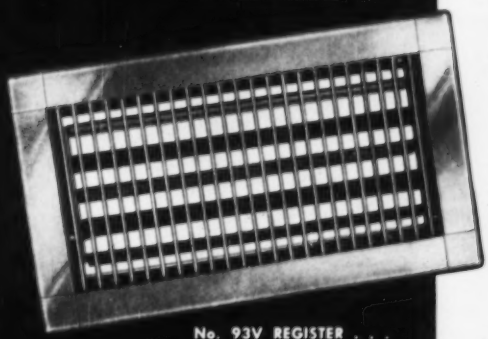
Because



No. 92VHV
— MULTI-DEFLECTION REGISTER
Vertical face bars, horizontal secondary bars, vertical louvers. Also available without valve, No. 92VHO.

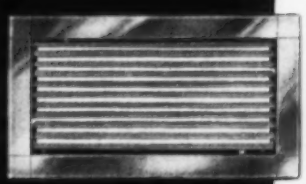
No. 92VOV — SINGLE DEFLECTION REGISTER with vertical face bars and louvers. Also available without valve, No. 92VOO.





No. 93V REGISTER . . . vertical front bars set straight, horizontal louvers.

No. 94A GRILLE . . . horizontal face bars set at 22° angle for up or down deflection.



HART & COOLEY

THEY PROVIDE Perfect Air Control

TRIPL-AIRE . . . REGISTERS & GRILLES for COMMERCIAL INSTALLATIONS

. . . are already downright favorites with a large and rapidly growing number of architects, air conditioning engineers and installers. For with this line it's never necessary to compromise. It permits you to readily achieve the exact air distribution, direction and volume best suited to each and every situation. There are 26 standard sizes, up to 36" x 12", offering 260 possible horizontal and vertical deflection combinations. Intermediate sizes up to 36" x 36" may be had on order. Front adjustments control face bars and louvers, and opposed louvers permit absolute volume control with equal distribution over entire face. Top quality "Decorator Gray" enamel finish. Your nearby H&C Jobber has complete details. We will be glad to furnish his name and location on request.

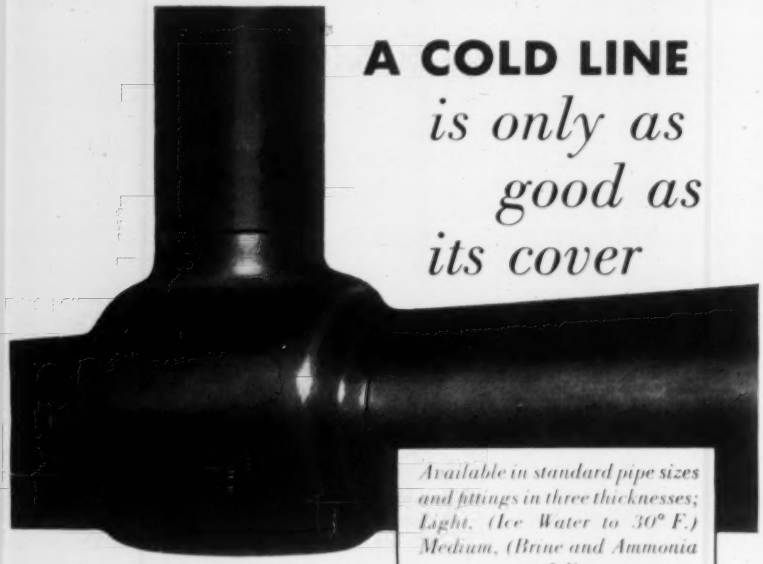
FIXT-AIRE . . .

. . . return air registers and grilles designed to complement and harmonize with the TRIPL-AIRE line. Registers have a single bank of face bars in fixed vertical or horizontal position, and feature the same opposed louver construction for positive volume control found in TRIPL-AIRE units. Grilles are available with horizontal face bars set at 22° angle for up or down deflection where desired. One-piece sizes up to 36" x 30".

CONVENIENT CATALOG GIVES COMPLETE DETAILS AND ENGINEERING DATA . . . Available from H&C Jobbers or write direct.

MEMBER INDOOR COMFORT

MANUFACTURING COMPANY
Dept. 2-AC HOLLAND, MICHIGAN



A COLD LINE *is only as good as its cover*

Available in standard pipe sizes and fittings in three thicknesses;
Light, (Ice Water to 30° F.)
Medium, (Brine and Ammonia to 0° F.)
Heavy, (Heavy Brine—25° F. and lower.)

UNITED CORK PIPE COVERING

THE IDEAL COLD LINE INSULATOR

A cold line system is only as effective as its insulation. Inferior pipe covering in just one section of the line will cause operating costs to skyrocket and a considerable loss in dollars to the cold storage operator. United's pipe covering gives you the best insulation with all these advantages:

Extremely low "K" factor
Retains over 80% of cold loss on piping
Easy and economical to install
Long trouble-free life
Fire retardant—Vermin resistant
No capillarity

LARGER STOCKS—FASTER DELIVERY—PERSONAL SERVICE

United Pipe Coverings are available from stock for prompt delivery—to fulfill your immediate installation requirements. Mail the coupon below for additional information or the name of the United distributor nearest you.

Corkboard

Pipe Covering

Tank Lagging

UNITED BB CORKBOARD

Manufacturers of cork insulation for almost a half century

UNITED CORK COMPANIES
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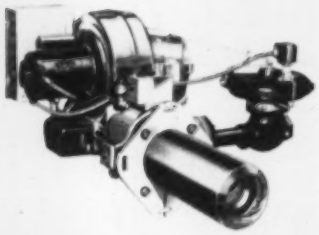
UNITED CORK COMPANIES, 1 Central Ave., Kearny, N.J.
Please send United Cork Catalog. I am interested in _____
NAME _____
FIRM _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

Engineering offices, or approved distributors, in key cities—coast to coast.

EQUIPMENT DEVELOPMENTS

Continued

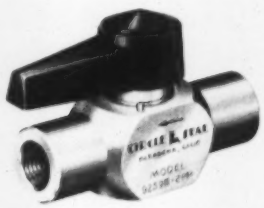
Reduction of size, weight has increased range, versatility of application without sacrificing durability, says company. Available with two types of shielding: T-shaped stainless steel shields with two open ends designed to reduce radiation losses to cooler side walls of gas passages; linen "Bakelite" open-end shields engineered to prevent condensation in hot junction, thus eliminating wet bulb effect and lowered temperature readings.



Gas Burners . . .

. . . with "explosion-free" control circuits — *Synchronous Flame, Inc., Dept. HPAC, Walworth, Mass.*

For 10 to 150 hp boilers in commercial, industrial buildings. Explosion resisting circuit accomplished by combination of electronic sensing device and relays which automatically lock out starting circuit of burner whenever explosion-producing conditions develop, says company. Extra purging cycle is then activated to clear undesirable conditions.



Plug Valve . . .

. . . designed to provide leakproof shutoff—*Circle Seal Products Co., Inc., Dept. HPAC, 2181 E. Foothill Blvd., Pasadena 8, Calif.*

Operated by handle that opens, closes against pressure with no effort,

TUBE-TURN

In small piping too you get big savings by welding

Five years ago, the generally accepted practice among engineers and contractors was to weld non-critical pipe larger than 2-inches and thread the smaller sizes. Today, that dividing line has gone down; much piping as small as ½-inch is now being welded. In small piping as in large, the big reason for welding is *to save money* . . . in installation cost, in material cost, in maintenance cost. See next page for typical results. For the small pipe jobs, too, you get the *most for your money* when you specify and buy TUBE-TURN* Welding Fittings and Flanges. Your nearby Tube Turns' Distributor can give you speedy service in sizes from ½-inch to 42 inches!

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

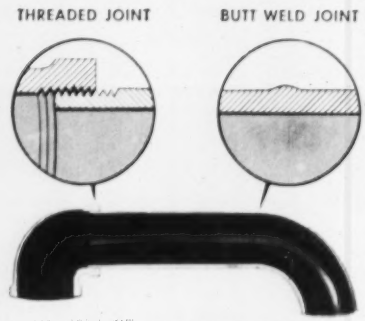
DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Kansas City • Denver
Los Angeles • San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

WHY IT PAYS...

SMALL DIAMETER PIPING... *why it pays to specify welded construction with* TUBE-TURN *Fittings*

NEVER LEAKS. Welded joints are permanently as strong and leakproof as the pipe itself. Photo shows welded lube oil lines for one of four diesel engines, replacing threaded lines which leaked. If welded in first place, would have saved $4000 replacement cost. Pipe is 2½" with TUBE-TURN Fittings.



CUTAWAY SECTION
OF 2" SCHED. 40 PIPE

SAVES MATERIAL. Threading cuts half of pipe wall away as shown. The welded joint is as strong as the pipe. An installation of Schedule 40 pipe, welded, is stronger than Schedule 80 threaded. Hence, for equal strength welded piping can cut material costs 30-50%.

TAKES LESS TIME to weld than to thread pipe above 2" and about equal time for smaller sizes, according to recent tests on hundreds of joints made by many different pipe fitters. Welded joints in 1½" piping such as the school heating line shown, averaged 7 minutes compared to 8 minutes for threading and tightening fitting.

IS COMPACT, NEAT. This installation of 1½" and 2" boiler blow-off piping shows ability to nest welded lines close together for better layout and streamlined appearance. Also, insulation, where needed, is easier to apply.

TOOLS ARE SIMPLE. Small, inexpensive welding outfits can cut, weld, heat to bend, solder or braze. They are easy to haul to job and simple to use. All pipe for this factory radiant heating system was fabricated on the site.

FITTINGS READILY AVAILABLE. In small sizes, too, your Tube Turns Distributor is stocked to give you prompt, efficient service. Call him on *all* your needs in welding fittings and flanges . . . from ½" to 42".

MORE INFORMATION—This bulletin gives helpful information on "The Economics of Welding Small, Noncritical Pipe". Mail the coupon for your free copy.

TUBE TURNS, Dept. A-6
224 East Broadway, Louisville 1, Kentucky

Please send free copy of "Economics of Welding Small, Noncritical Pipe".

Company Name _____

Company Address _____

City _____ *Zone* _____ *State* _____

Your Name _____

Position _____

Available from your nearby TUBE TURNS' distributor

*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

DISTRICT OFFICES:

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TUBE TURNS

A DIVISION OF NATIONAL CYLINDER GAS COMPANY
LOUISVILLE 1, KENTUCKY

EQUIPMENT DEVELOPMENTS

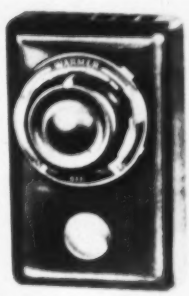
Continued

says company. Design of plug features use of three o-rings. In closed position, one ring on surface of plug serves as flow seal. This surrounds inlet port, provides shutoff. In open position, valve is full ported, allows straight through flow passage. Static o-rings at top and bottom of plug and around its circumference prevent stem damage, says company. Valve available with ¼ in. female pipe connections.

Spray Nozzle . . .

. . . with large capacity—*Spraying Systems Co., Dept. HPAC, 3201 Randolph St., Bellwood, Ill.*

For cooling, washing, related operations. "2-U-Veejet" capacity ranges 73 gpm at 15 psi to 330 gpm at 300 psi. In two types of spray angles. With 2 in. male pipe connection.



Electric Heat . . .

. . . thermostat for localities that require double pole disconnect switch located at each thermostat—*White-Rodgers Co., Dept. HPAC, 1209 Cass Ave., St. Louis 6.*

Designed for use on such installations as cable heat, glass panels, electric baseboards, rubber panels, similar applications. Cited features in-

Four Good Reasons for Specifying

GOODALL EXPANSION JOINTS

Because they are made of rubber, Goodall Expansion Joints have certain advantages stemming from rubber's natural characteristics. Among these are the following:

1—LONGER SERVICE LIFE. Continuous movement during expansion and contraction actually keeps the rubber joint "alive". There is no deterioration through embrittlement or corrosion.

2—SENSITIVE RESPONSE TO PRESSURE. Only the slightest pressure is required to create movement in the rubber joint, in any direction. Stress on metal pipe or other connected member is therefore reduced to an absolute minimum.

3—EASIER TO INSTALL . . . on new construction or as replacements for other types. Light in weight . . . short face-to-face dimensions . . . retaining rings or flanges quickly aligned and bolted. No gaskets required.

4—AVAILABLE IN "FLANG-LOK" STYLE . . . a patented Goodall development which provides exceptional ease of installation; a far greater sealing face area than the standard right-angle style; and a seal that is completely non-metallic.

* * *

Goodall Rubber Expansion Joints are custom-built to meet specific requirements in sizes from ⅜" I. D. to 96" I. D., for pressures up to 125 lbs. P.S.I. and/or vacuum. They are available in Right Angle and Sleeve Types, as well as "Flang-Lok"; single or multiple arch; tapered; offset; and rectangular.

* * *

Send for Illustrated Booklet, or Contact Our Nearest Branch

"If it's GOODALL, it MUST be Good!"

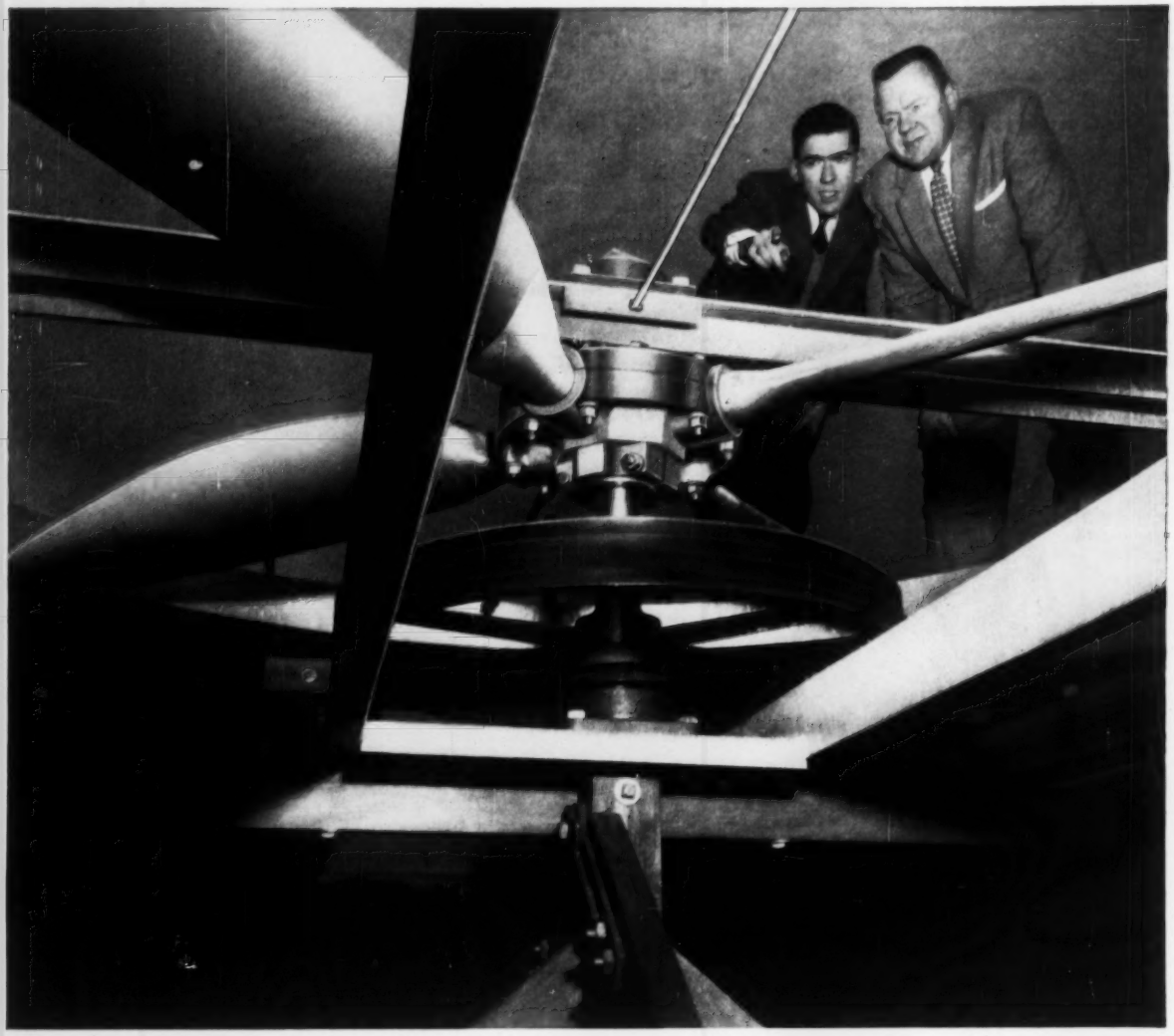
Standard of Quality—Since 1870

HOSE · BELTING · FOOTWEAR · CLOTHING AND OTHER INDUSTRIAL RUBBER PRODUCTS

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

Branches and Distributors Throughout the United States and in Canada



"Take a look at the fan assembly on this LoLine Tower, Charlie."

"Looks rugged, doesn't it?"

"And it is. Yet the design is simple. About all there is to it is that heavy-duty fan wheel; those over-size bearings, the multi-V belt drive and that galvanized fan stack."

"Where's the motor?"

"Outside of the hot, moist air stream. No corrosion that way. Pritchard doesn't give rust a chance on the LoLine. Notice that the structural members supporting the fan assembly are hot-dip galvanized."

"But how about the fan shaft? Is it protected, too?"

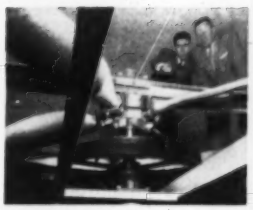
"Stainless steel! And it has self-aligning bearings. See how those snap rings are used for positioning bearings! Speaking of the bearings—you grease these bearings from *outside* of the tower."

"Outside!"

"Yes, see those copper tubes? They run from the grease fittings outside to the bearings. Makes lubrication much easier and a lot safer. Pritchard also makes available a speed reducer drive, if desired."

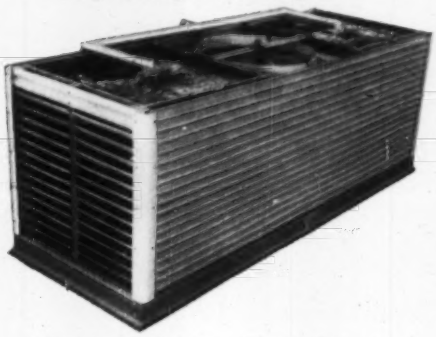
"No wonder you were so excited about this LoLine tower. Pritchard sure did go out of their way to make it a good one didn't they?"

J. F. PRITCHARD & CO. OF CALIFORNIA
4625 Roanoke Parkway, Kansas City 12, Mo.



"Take a look at the fan assembly on this LoLine tower, Charlie."

Pritchard LOLINE® Is Lowest Silhouette Tower of 75 Tons Capacity and Up!



The Pritchard LoLine Cooling Tower is the lowest (7′ 7 11/16″ over-all) tower of 75 tons capacity and up now available. The LoLine incorporates many features in its design which are unique in low silhouette tower construction:

1. Galvanized steel fan drive supports and basin accessories.
2. Grease fittings for bearings on V-belt drive are outside tower.
3. Corrugated asbestos cement board casing.
4. Asbestos cement board louvers are standard, not special equipment.
5. Internal pipe supply system. Piping is completely concealed. (Optional.)
6. V-belt drive has stainless steel fan shaft.

GET ALL THE FACTS!

Write today on your company letterhead for your copy of the LoLine Bulletin 5.1.902. It gives complete details on this new, low silhouette tower. No cost or obligation, of course.

INDUSTRY'S PARTNER FOR PROGRESS

J.F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 473, 4625 Roanoke Parkway
Kansas City 12, Mo.

COOLING TOWERS * GAS & AIR TREATING EQUIPMENT
REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

EQUIPMENT DEVELOPMENTS

Continued

clude: *off* dial position at which both sides of 240 volt line are disconnected and no temperature change can close contacts; new type sensitive element for obtaining very sensitive reaction to radiant heat, air temperature.

Electric Hammer . . .

. . . which uses shock waves to facilitate high speed drilling—*Demo-Haines Tool Corp., Dept. HPAC, Enid, Okla.*

Creating over 36,000 shock waves per min, portable rotary unit is said to cut clean, true holes to 40 ft deep through stone, rock, reinforced concrete. Requires no pressure, says company. Designed for drilling 3/16 to 1½ in. diameter holes for piping, slug-ins, electrical installations.

Swivel Joint . . .

. . . new feature of company's "Flanco" four-bolt, split flange, pressed-on coupling—*Anchor Coupling Co., Inc., Dept. HPAC, 342 N. Fourth St., Libertyville, Ill.*

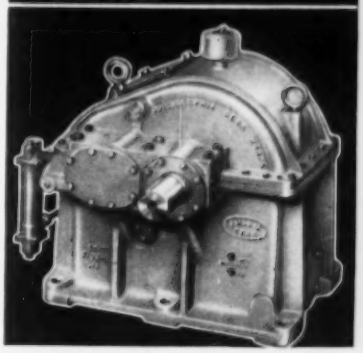
Is said to aid in positioning, installing. Available on couplings in sizes ½ to 11½ in., in standard metal bends zero to 90 deg.

Brazing Alloys . . .

. . . for stainless steel, heat resistant alloys—*Handy & Harman, Dept. HPAC, 82 Fulton St., New York 38.*

High nickel content alloys are said

for INDUSTRIAL and AIR CONDITIONING SERVICE . . .



Phillie Gear *standardized*
HI-SPEED REDUCER INCREASER

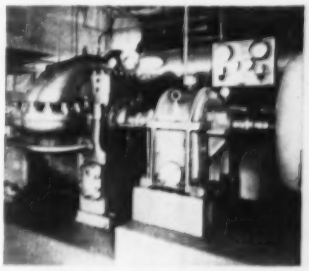
These modern, ruggedly-built Standardized Units contain all the features and advantages of custom-built units; being specially designed for *increaser or reducer applications*—where rotating speeds range as high as 9000 r.p.m., or pitch line velocities up to 10,000 feet per minute.

Phillie Gear Hi-Speed Units meet the current trend toward higher prime-mover speeds of steam turbines, ultra high speed electric motors, or internal combustion engines—for driving Compressors, Pumps, etc. at *reduced speeds*, or the *increased speed* required for driving many Pumps, Compressors, Fans and Generators.

All helical gears and shafts are dynamically balanced to give the ultimate in vibration-free power transmission.

These Hi-Speed Units are available for horsepowers from 1 to 7,100; ratios 1:1 to 10:1, for either speed increasing or speed reducing.

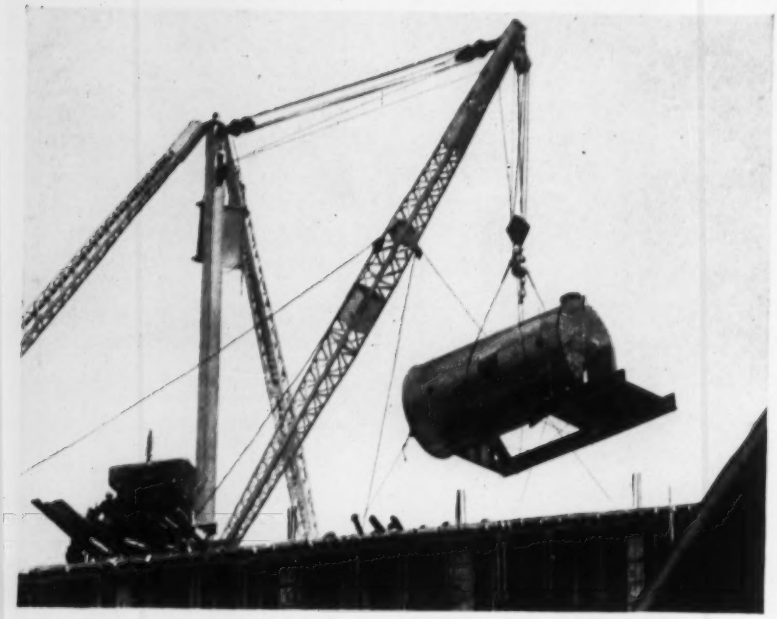
Send for Catalog HI-55.



A Phillie Gear HI-SPEED Air Conditioning Drive Installation, Sears Roebuck Co., Pittsburgh, Pa. Input 342 HP with 1.3.56 Increase, Output speed 6230 RPM

phillie gear®
PHILADELPHIA GEAR WORKS, INC.
ERIE AV & G STREET, PHILADELPHIA 34, PENNA.
Offices in all Principal Cities
INDUSTRIAL GEARS & SPEED REDUCERS
LIMITORQUE VALVE CONTROLS
FLUID MIXERS • FLEXIBLE COUPLINGS
Virginia Gear & Machine Corp. • Lynchburg, Va.

KORFUND
VIBRATION CONTROL



1500 Massachusetts Ave. Corp.—Owner
Ring Engineering Co.—Builder
F. Wallace Dixon—Architect
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Standard Engineering Co.—Mechanical Contractor

lets you

PUT 'EM ON THE ROOF!

The roof, or an upper floor, is the best place for heating and air conditioning equipment, keeps basements free for other revenue-producing uses such as parking, storage, etc.

Korfund Vibration and Noise Control units let you install heavy boilers, compressors, fans, etc., without transmitted vibration to floors below. The photograph shows a boiler being hoisted to the roof of the 8-story 1500 Massachusetts Ave. apartments in Washington, D. C. The completed installation, which included Korfund-mounted boilers, pumps, compressors and fans, has been in operation for well over a year now, and the tenants on the floor immediately below don't even know of the existence of the equipment immediately over their suites.

This is just another example of the effectiveness of Korfund units. Their efficiency did not come about by accident — it's the result of more than a half-century of experience in the vibration and noise control field. Why not put this experience to work for you?

Write for a copy of the booklet, "Air Conditioning Goes Up in the World," which describes Korfund's role in vibration and noise-free upper floor installations. We'll also include a copy of "Vibration Control Specifications for Air Conditioning Equipment." Ask for Bulletin 31.

For specific recommendations contact us or one of the 46 local Korfund offices. Look under "Korfund" in your local Telephone Directory or in Thomas' Register.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

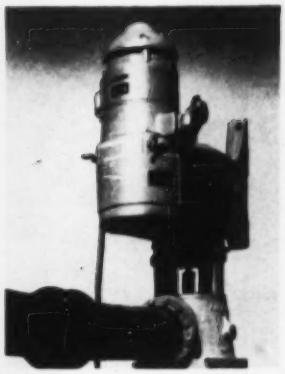
THE KORFUND CO., INC.

48-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

EQUIPMENT DEVELOPMENTS

Continued

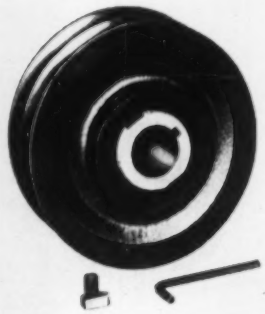
to offer good corrosion resistance, performance at elevated temperatures. Particularly useful for brazing austenitic stainless steel, high nickel heat resistant and precipitation hardening alloys, says company. Available as cast rod, powder, resin bonded sheet and in sintered forms.



Motors . . .

. . . in combination with variable flow vertical booster pumps—Pumps made by *Wintroath Pumps, Inc., Dept. HPAC, Alhambra, Calif.* "Varidrive" motors by *U.S. Electrical Motors, Inc., Dept. HPAC, 200 E. Slauson Ave., Los Angeles 54.*

Recommended by companys for delivery of desired amounts of water within prescribed periods of time.



Sheaves . . .

. . . of one- and two-groove design engineered for quick, easy speed adjustment of company's "Texrope" v-belt drives in A and B sections—*Allis-Chalmers Mfg. Co., Dept. HPAC, 1171 S. 70th St., Milwaukee.*

For low horsepower applications, "Magi-Key" sheave is said to pro-

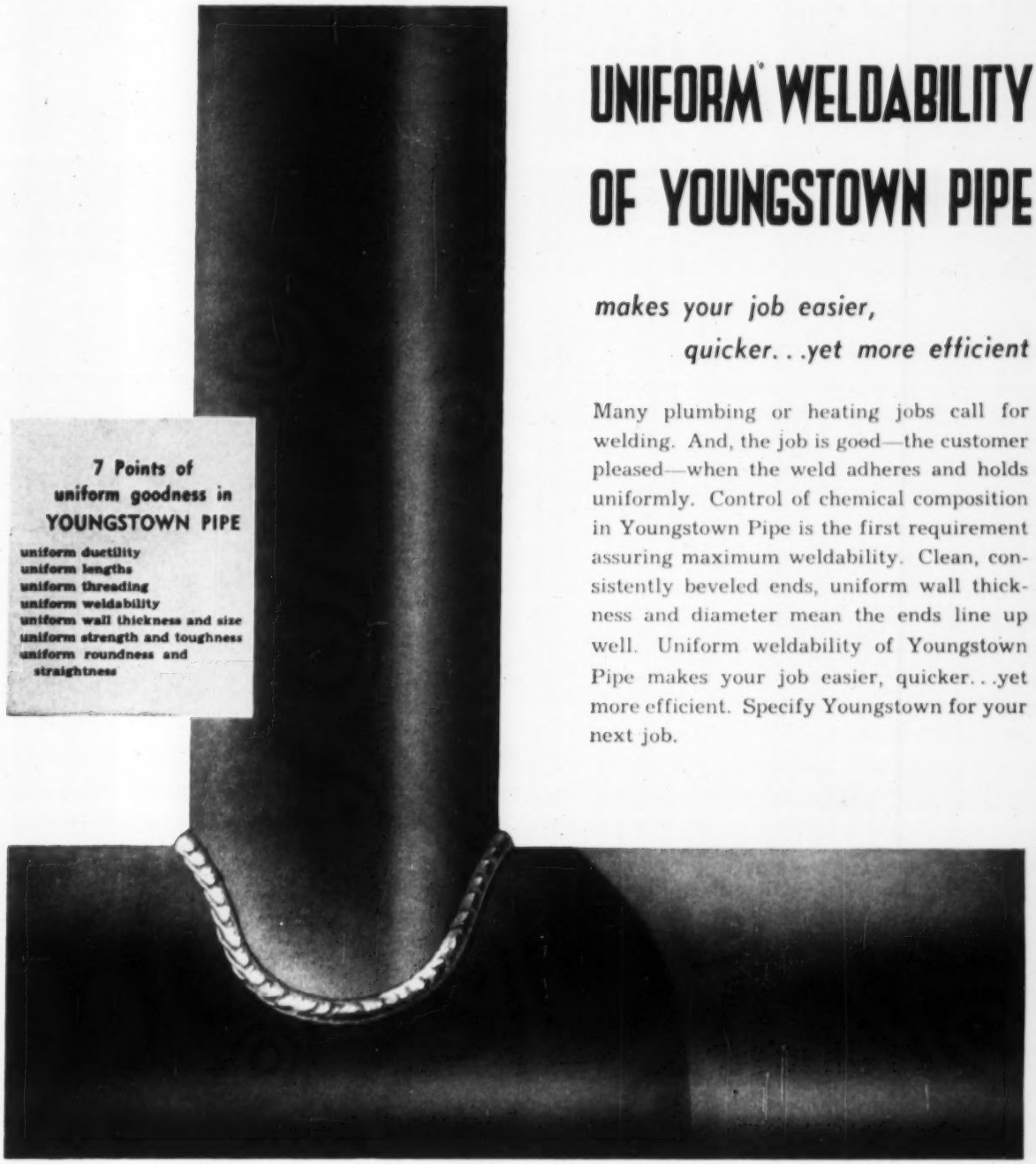
UNIFORM WELDABILITY OF YOUNGSTOWN PIPE

makes your job easier, quicker. . .yet more efficient

Many plumbing or heating jobs call for welding. And, the job is good—the customer pleased—when the weld adheres and holds uniformly. Control of chemical composition in Youngstown Pipe is the first requirement assuring maximum weldability. Clean, consistently beveled ends, uniform wall thickness and diameter mean the ends line up well. Uniform weldability of Youngstown Pipe makes your job easier, quicker. . .yet more efficient. Specify Youngstown for your next job.

7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness



Youngstown PIPE

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY Manufacturers of Carbon, Alloy and Yoloy Steel

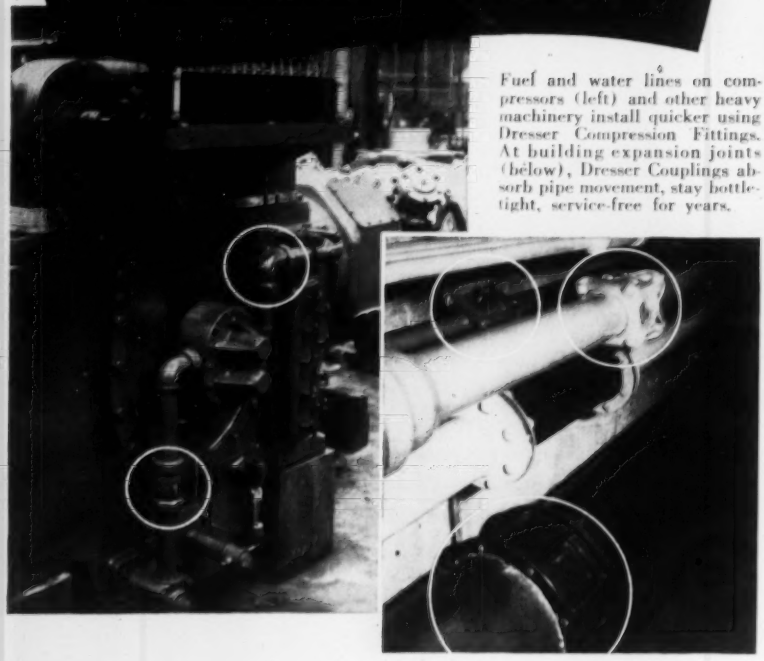
General Offices Youngstown, Ohio District Sales Offices in Principal Cities

SHEETS · STRIP · PLATES · STANDARD PIPE · LINE PIPE · OIL COUNTRY TUBULAR GOODS · CONDUIT AND EMT · MECHANICAL TUBING · COLD FINISHED BARS · HOT ROLLED BARS · WIRE · HOT ROLLED RODS · COKE TIN PLATE · ELECTROLYTIC TIN PLATE · BLACK PLATE · RAILROAD TRACK SPIKES · MINE ROOF BOLTS

FOR IN-PLANT PIPING...

the DRESSER way

is *Easier... Surer!*



Fuel and water lines on compressors (left) and other heavy machinery install quicker using Dresser Compression Fittings. At building expansion joints (below), Dresser Couplings absorb pipe movement, stay bottle-tight, service-free for years.

You're sure of providing the quickest, most trouble-free installations . . . at the lowest possible over-all costs . . . when you use Dresser Style 38 Couplings and Style 65 Compression Fittings!

They eliminate threading, exact pipe fitting, grooving, soldering, flaring and caulking. With Style 65s, for instance, you simply stab plain pipe ends into a factory-assembled unit and tighten the end nuts. Style 38s assure permanent, bottle-tight joints for plain-end steel, cast iron or other pipe . . . wrench-installed in but two man-minutes per bolt.

Style 65 Fittings are available in sizes from 3/8" to 2". Style 38 Couplings to 12" OD and over.

SEE YOUR LOCAL PIPING SUPPLIER TODAY

for the complete Dresser line of couplings, ells, tees, adapters, etc.

DRESSER®

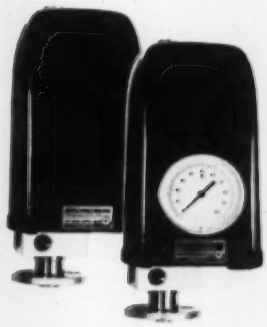
ONE OF THE DRESSER INDUSTRIES

Dresser Manufacturing Division, 79 Fisher Ave., Bradford, Pa.

EQUIPMENT DEVELOPMENTS

Continued

vide for increased maximum design horsepower. Keys transmit rotational torque, i.e., from shaft to hub and hub to discs. Set screws no longer bite into threads, says company. Flexibly joined set screw and key designed to give positive lock between movable discs, stationary hub.



Flow Transmitters . . .

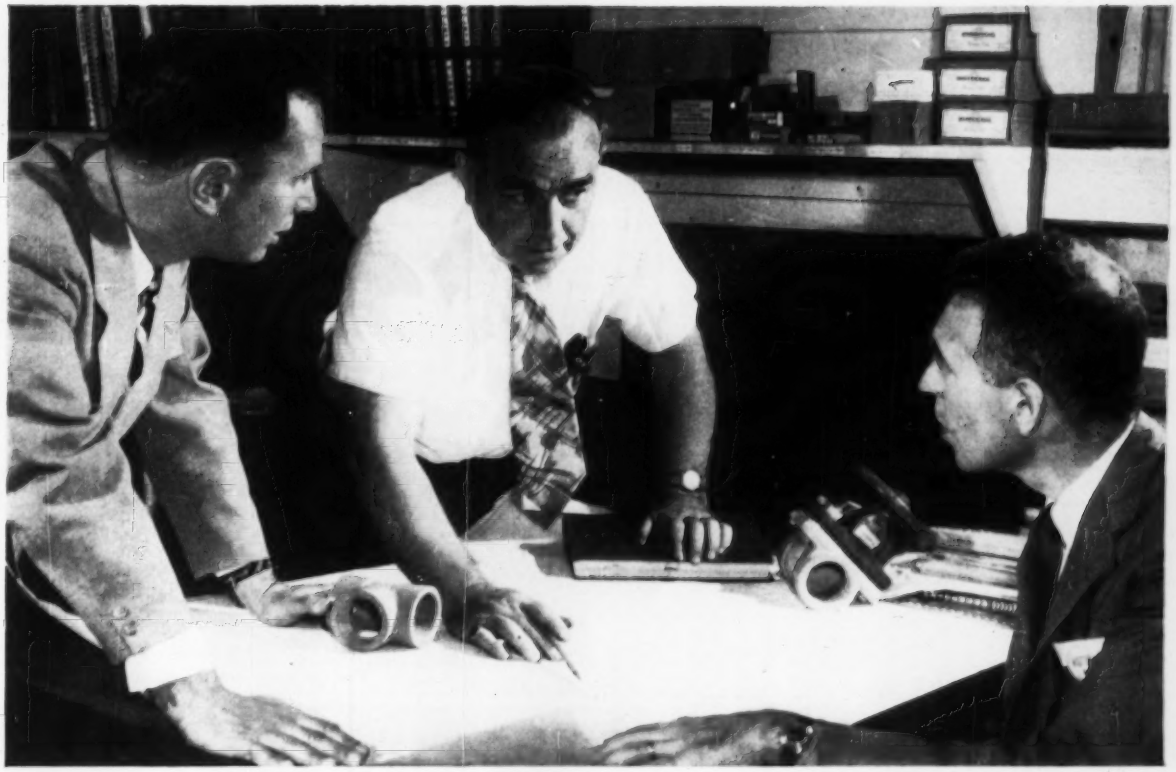
. . . for pneumatic, electric service—*Brooks Rotameter Co., Dept. HPAC, Lansdale, Pa.*

"Mag/Nu/Matic" pneumatic unit employs direct force balance to minimize mechanical motion. This is said to provide low inertia characteristics, improved response time. "Elec/Tru/Matic" electric model utilizes strain gage element. Standard model has explosionproof design.

Portable X-Ray Units . . .

. . . for industrial radiographic examination—*Mitchell Radiation Products Corp., Dept. HPAC, 123 E. Washington St., Norristown, Pa.*

In four models for inspection of welds, assemblies. Three units designed for heavy duty work while fourth is smaller trepanning model



Pictured above are Sidney A. Lewis of the Walworth Sales Staff, Lewis A. Crabb of Machlett Laboratories and Jack I. Hoffman of the Connecticut Plumbing Supply Company, discussing plans for a new and complex piping installation. The smaller view shows a few of the lines for which Walworth PVC Valves and Fittings were selected.

"We can count on Walworth for personal attention"

Says Lewis A. Crabb, chief maintenance engineer of Machlett Laboratories, Springdale, Conn.

When the Machlett Laboratories faced a specialized problem in the piping of waste acids of all types, including those used for etching, they needed more than fine valves and fittings. They required the kind of personal help and advice that comes only with sound experience.

Sidney A. Lewis, of the Technical Sales staff of Walworth sat down with Mr. Crabb, studied the problem and helped to select the exact Walworth equipment that would give the best possible service.

Backing up Walworth products with friendly capable technical help is regular procedure with all of our staff. On your next problem involving valves and fittings, call Walworth.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

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60 East 42nd Street, New York 17, New York

SUBSIDIARIES: ALOYCO ALLOY STEEL PRODUCTS CO. CONOFLOW CORPORATION GROVE VALVE & REGULATOR CO. SW SOUTHWEST FABRICATING & WELDING CO., INC. MH M & H VALVE & FITTINGS CO. WALWORTH COMPANY OF CANADA, LTD.

California contractor estimates:

Time and labor costs cut 75% with the Remington Stud Driver

Out on the California coast, "Research House for '56" is taking shape. It's an experimental house sponsored by Associated Architectural Publications and the latest tools are being used to build it—such as the Remington Stud Driver.

Contractor Bert Pickney says, "The Stud Driver cuts time and labor costs around 75% in anchoring beam supports, partition sills and furring to concrete. It took us only half a day to install the sills—a 2-day job with bolts. No pre-drilling and sills set tight! I certainly recommend the Stud Driver to any contractor!"

YOU CAN SPEED ALL STUD FASTENINGS—light, medium and heavy-duty—with the Remington Stud Driver. It sets *both* ¼" and ⅜" diameter studs in steel or concrete—up to 6 studs a minute either size. The tool is cartridge-powered, portable, ready to work *anywhere*. Forty styles and lengths of Remington Studs to choose from. Get full details by mailing coupon.

Remington

DUPONT

STUD DRIVER

Industrial Sales Division, Dept. H-12
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed the job and save with the Stud Driver.

*Name*_____ *Position*_____

*Firm*_____

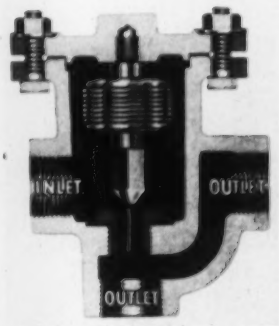
*Address*_____

*City*_____ *State*_____

EQUIPMENT DEVELOPMENTS

Continued

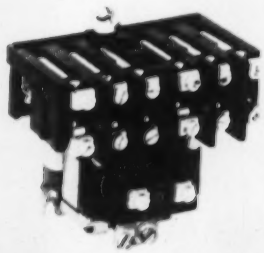
for spot examination of welds, light radiography. Are said to be dustproof, waterproof, shockproof.



Thermostatic Traps . . .

. . . designed for installations requiring wide variation between startup and operating load, frequent shutdowns and startups, large amounts of air elimination on startup or during operation—*Clark Mfg. Co., Dept. HPAC, 1830 E. 38th St., Cleveland 14.*

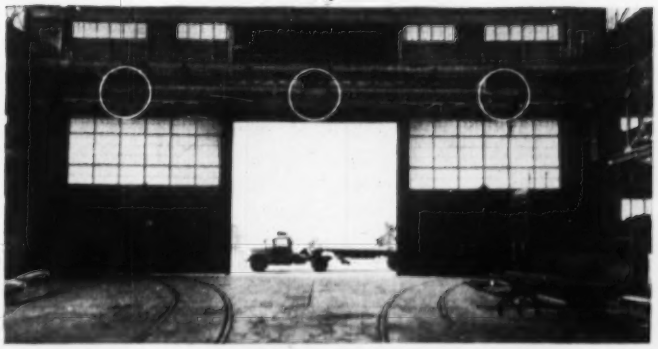
Of cast semi-steel, cast steel or cast bronze construction, trap is fitted with orifice that operates entire pressure range, from zero gage to maximum rated pressure, without necessity of adjustment, says company. Available for steam pressures to 300 psi, temperatures to 500 F. Inlet, outlet connections range ½ to 2 in.

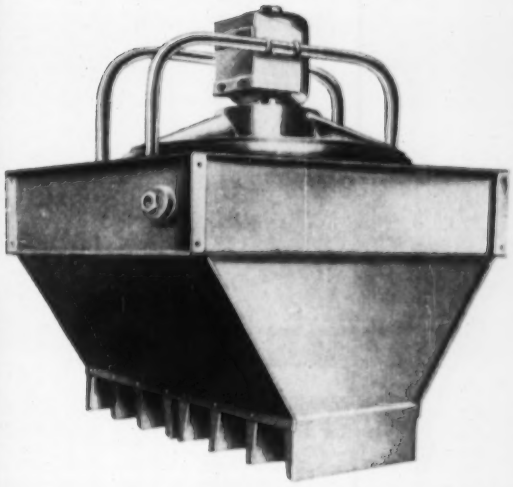


10 Amp Relay . . .

. . . designed for applications on control panels, machine tools—*General Electric Co., Dept. HPAC, Schenectady 5, N.Y.*

Engineered to increase flexibility, conserve panel space by reducing number of extra relays necessary. Saddle-type terminal permits wiring





open doors

in cold weather can cause labor unrest

...eliminate cold blasts with

WING DOOR HEATERS

When large outside doors are opened in winter time

1—Cold drafts rush in.

2—Workers are chilled.

3—Health is endangered.

4—Production slows down.

5—Heating system is strained.

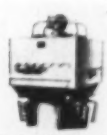
Avoid these ill effects by installing Wing High Velocity Door Heaters.

As soon as doors are opened a curtain of hot air covers the open doorway. Workers inside then feel only a comfortable, warm gentle air movement. Wing Door Heaters use little steam as they operate only when doors are open. Actuation is by thermostat or a door switch or both. Write for Bulletin DH-2A.

L. J. Wing Mfg. Co. 140 Vreeland Mills Rd., Linden, N. J.
Factories: Linden, N.J. and Montreal, Canada
In Europe: WANSON, Haren-Nord, Brussels, Belgium

Wing
High Velocity
DOOR HEATERS

WING REVOLVING HEATERS



WING FRESH AIR SUPPLY HEATERS

WING DRAFT INDUCERS

WING TURBINES

Mail this coupon for bulletin

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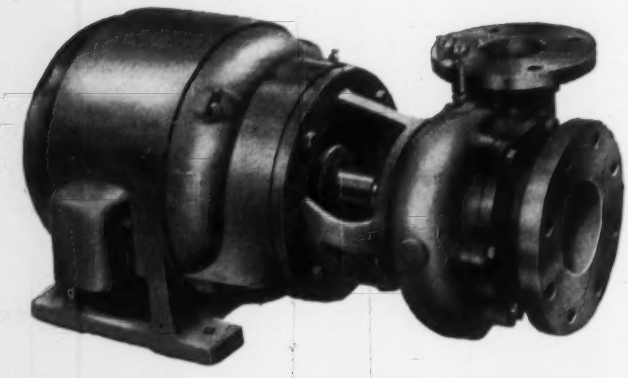
140 Vreeland Mills Rd., Linden, N.J.
Please send me Bulletin DH-2A—Door Heaters.
Name .....
Firm .....
Address .....
City ..... Zone ..... State .....



WHERE A "BUFFALO" CLOSE-COUPLED PUMP IS YOUR BEST CHOICE

1. *Where space is limited,* "Buffalo" CCL Pumps are unequalled for compact design with high capacity. For example, a 4" pump with 15 HP motor, takes up less than 2 cu. ft., yet delivers 600 gpm at 60-ft. head.

2. *Where "package" installation is desirable,* you have a ready-to-run unit with shaft permanently pre-aligned for fast, simplified installation on the site or as part of original equipment. Readily adjustable to 4 discharge positions.

3. *Where you want high efficiency,* you will find these pumps up to the high performance standards of all "Buffalo" Pumps.

4. *Where you want durability and freedom from troubles,* "Buffalo" Close-Coupled Pumps are an ideal choice. They are built to take punishment — with heavy cast mounting brackets, rugged shell, husky, accurately machined impeller, large diameter shaft and stuffing boxes holding at least 8 rings of packing. Side plate (inlet) is readily removable to give access to rotor. You have a husky, easily serviced unit.

These and other "Q" Factor* advantages are yours in any clear water service up to 1100 gpm, when you specify "Buffalo" Close-Coupled Pumps. Write for Bulletin 975 for full details.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo" PUMPS

BUFFALO PUMPS

DIVISION OF BUFFALO FORGE COMPANY

171 MORTIMER ST. • BUFFALO, N. Y.

Canada Pumps, Ltd., Kitchener, Ont.

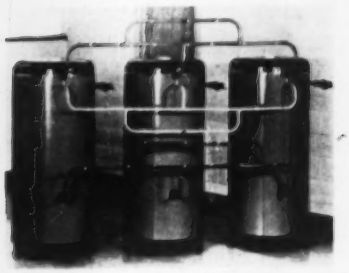
Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

EQUIPMENT DEVELOPMENTS

Continued

from four directions. Available in standard, latched-in forms, in two-, three-, four-, six-pole models, in voltages and frequencies to 600 volts, 60 cycles.



Manifold Assembly . . .

. . . for use with commercial installations of company's "Sanimaster" gas water heaters—*Ruud Mfg. Co., Dept. HPAC, Kalamazoo, Mich.*

"Equaflow" designed to solve problem of unequal flows of hot water from multiple unit installations of storage gas water heaters in motels, hotels, apartment houses, schools, institutions, restaurants. Is said to eliminate one or more units not supplying their proportionate share of hot water.

Tube Plug, Connector . . .

. . . designed to speed testing of air conditioner, refrigeration circuits—*Mechanical Products Corp., Dept. HPAC, 168 N. Ogden Ave., Chicago.*

Is said to provide fast, safe, efficient method of attaching pressure, vacuum, charging lines to straight end tubing. Developed primarily for processing of air conditioning, refrigeration circuits in line production. Connector engineered to operate at pressures to 1000 psi, vacuums to 25 microns.

Brazing Rings . . .

. . . prefabricated to speed stainless steel tube assembly—*Wall Colmonoy Corp., Dept. HPAC, 19345 John R. St., Detroit 3.*

Cited features for "Nicrobraz" rings include: improved quality in brazed joint, better finished appear-

SARCO HEATING SPECIALTIES—a complete line

Float Thermostatic Steam Traps

Inverted Bucket Steam Traps

Thermodynamic Steam Traps

Radiator Valves

Radiator Traps

Strainers

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UNDIVIDED RESPONSIBILITY
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- ★ Finned-Tube and Baseboard Radiation
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Complete Systems Include All Accessory Equipment

Modulating Controls for hot water and radiant heating

Modulating Controls for steam heating

Type AO Controls for hot water and radiant heating

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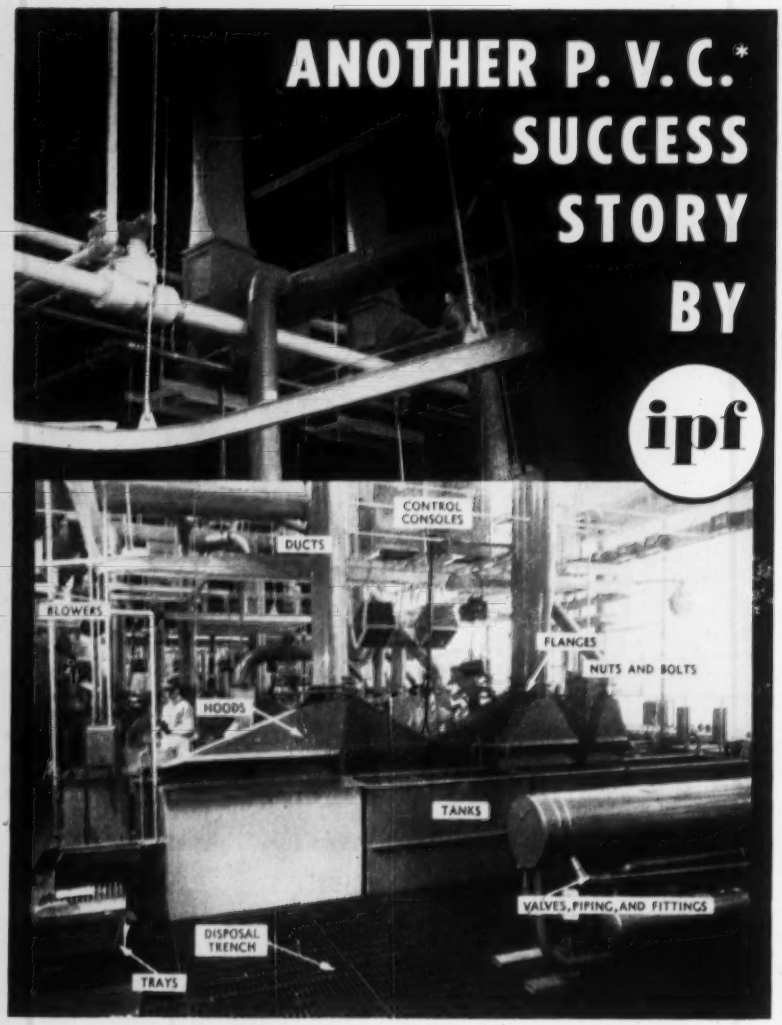
finned-tube and baseboard radiation

21328



Scintilla Division of Bendix Aviation Reports Maintenance-Free P.V.C. Service

**Rigid Polyvinyl Chloride (P.V.C.) Fabrication by Industrial Plastic Fabricators — the new material of construction — is being used for 90% of the equipment at Scintilla Division's new Plating Rooms.*

These facilities, generally recognized as the most modern in the country, have used IPF Products without a single replacement.

Plating tanks . . . stands . . . exhaust systems . . . baskets and trays . . . and drainage troughs were a frequent source of interrupted production when corroded metal equipment needed replacement. Even costly rubber lining of the metal to protect against the acids and corroding fumes did not solve the problem. But — since Scintilla Division's conversion to P.V.C. — no replacements, no slowdowns, no lost time.

IPF blowers, hoods, tanks, ducts, piping systems, valves, nuts, and bolts, and machine parts can also solve your corrosion problems. P.V.C. is a lightweight, smooth surfaced, nonporous, plastic material. Its inherent anti-corrosive qualities insure long life — reduced maintenance costs.

Complete information on P.V.C., "the new material of construction" available upon request.

MANUFACTURED BY
industrial plastic fabricators, inc.
NORWOOD, MASS. NOrwood 7-3411

EQUIPMENT DEVELOPMENTS

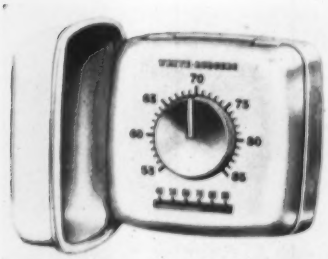
Continued

ance, elimination of waste, reduced assembly time. Available in variety of alloy grades for air conditioning, chemical, aircraft, other industries.

Propane Torch . . .

. . . with push-button design *Otto Bernz Co., 280 Lyell Ave., Rochester 6, N. Y.*

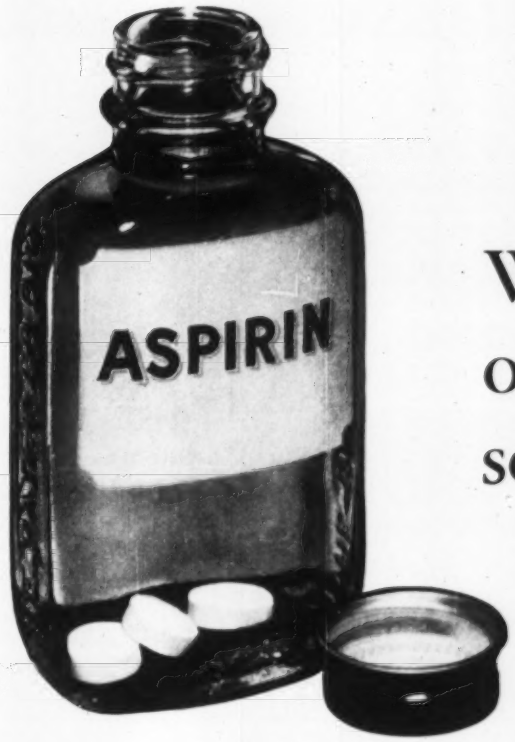
Differs from other torches in line only in larger size of burner, push-button valve and knob. Is said to produce larger flame which maintains constant maximum temperature of 2010 to 2050 F. Flame ignited by pilot, thus eliminating necessity of burning larger flame at all times, conserving fuel when not in actual use, says company.



Thermostat . . .

. . . with "attractive" hinged cover to eliminate "mechanical look" *White-Rodgers Electric Co., Dept. HPAC, 1209 Cass Ave., St. Louis 6.*

Designed to operate relays, gas valves, timers, oil burner primary controls. Heat anticipated type units have special adjustment to produce "scientific" frequency of burner operation, says company. Equipped with dual anticipators that permit use with company's primary controls.



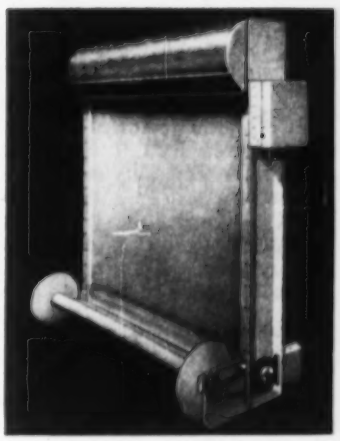
We had our headaches so you wouldn't!

The AAF Roll-O-MATIC air filter features *built-in* trouble-free operation

THE idea of the Roll-O-Matic air filter seemed simple enough. The *idea* was . . . but development and perfection *were not*. The goal of positive automatic operation plus simple, once-a-year maintenance offered some thorny problems.

To reach that goal, AAF developed Roll-O-Mat—the "miracle" filtering material of fluffy, bonded glass fibres that compresses to paper-like thinness on the roll. That's not all. The Roll-O-Matic also required a specially-compounded viscosine (for pre-charging media) that retained its jelly-like consistency under a wide range of temperature and humidity conditions . . . without being sticky to handle on the roll.

Your response to the AAF Roll-O-Matic has proven that it's worth a lot of headaches to be able to offer a headache-free air filter. For complete details on the *one-and-only* Roll-O-Matic, call your nearest AAF representative or write direct for Bulletin 248A.



AAF Dust Control Equipment

Illinois Heating Specialties

American Air Filter
COMPANY, INC.
315 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

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Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators

ONE OF THE GARLOCK 2,000

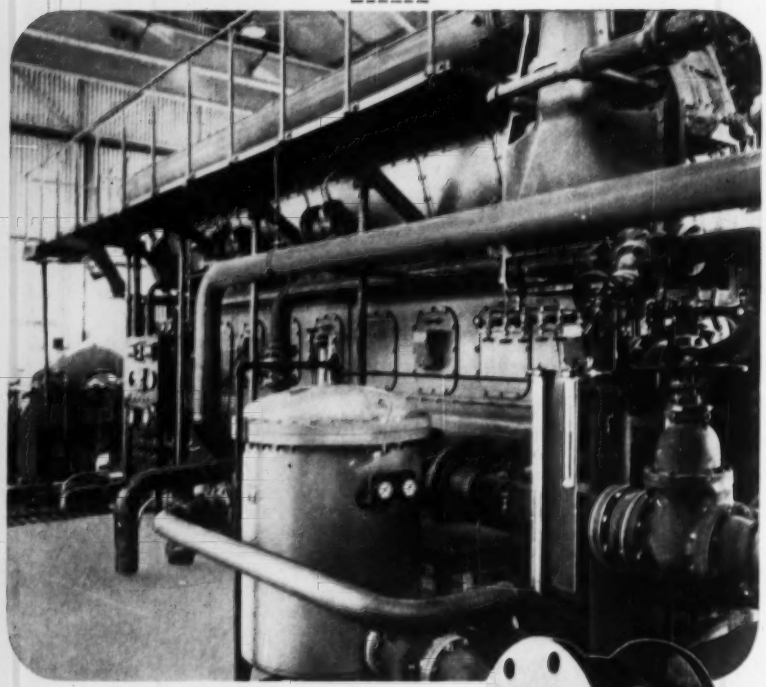
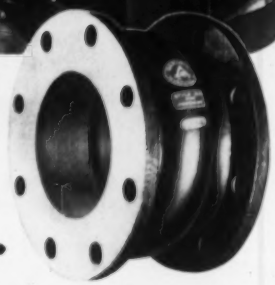


Photo Courtesy Cooper Bessemer Corp.

First Unattended Compressor Station Installs...



DEPENDABLE GARLOCK EXPANSION JOINTS Gulf Interstate Gas Company's Stanton, Kentucky station automatically pumps 400,000,000 cu. ft. of gas per day into northern markets. It's the first fully-automatic engine driven centrifugal compressor station...it's remote-controlled from Clementsville, Ky., 80 miles away. Obviously, the equipment supplied for such a project had to be the most reliable. Garlock neoprene-lined Expansion Joints were used on both oil and water lines to dampen vibration.

Rubber Expansion Joints are an important part of "the Garlock 2,000"...two thousand different styles of dependable gaskets, packings, and seals. It's the only complete line. It's one reason you get *unbiased* recommendations from your Garlock representative. Call him or write for Expansion Joint Bulletin AD-137.

THE GARLOCK PACKING COMPANY, Palmyra, New York

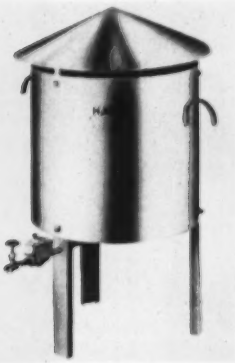
For Prompt Service, *contact one of our 30 sales offices and warehouses throughout the U. S. and Canada.*

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Rubber Expansion Joints

EQUIPMENT DEVELOPMENTS

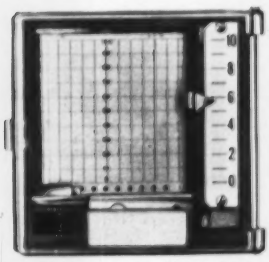
Continued



Gas Burning Salamander . .

. . .designed to provide temporary heat in commercial, industrial and public construction, other areas. —*Hauck Mfg. Co., Dept. HPAC,* 124-36 *10th St., Brooklyn* 15.

Burns LP, bottled gas. Designed to be lightweight, yet have rugged construction. Fired by either low or high pressure internal jet gas burner. In two sizes rated 150,000 and 225,000 Btu per hr.



Potentiometer . . .

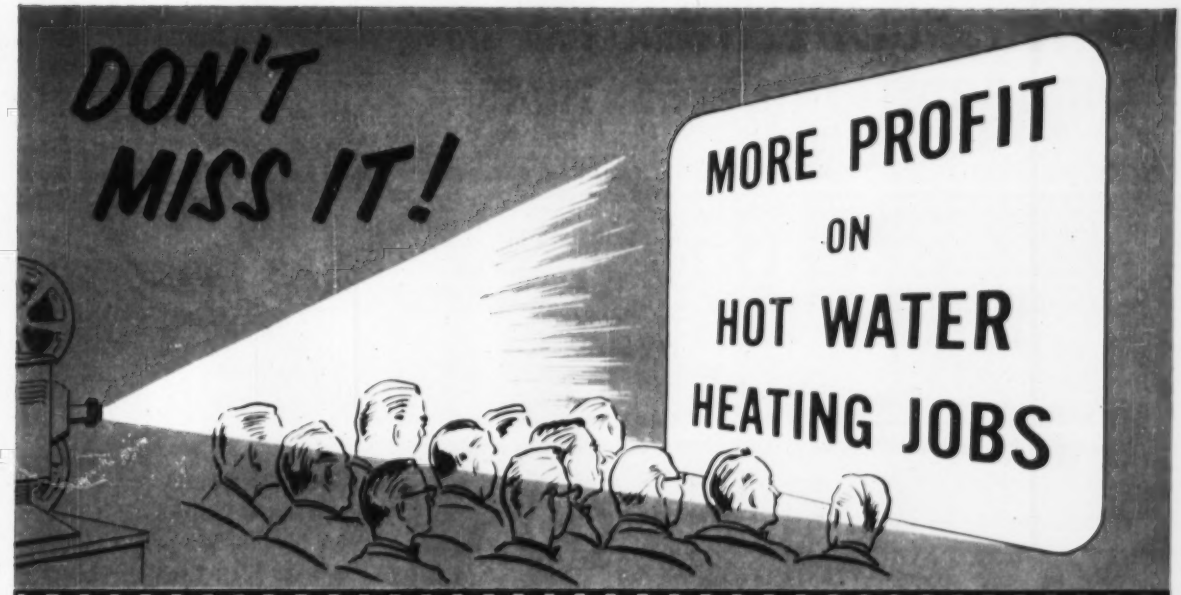
. . .engineered to give continuous record on 3 in. strip chart—*Bristol Co., Dept. HPAC, Waterbury, Conn.*

Self balancing electronic unit uses standard components, is housed in case 5 in. square. Designed to measure, indicate or record any variable which can be converted into an electrical quantity—such as temperature, pressure, flow, speed, pH, smoke density.

Pressure Switch . . .

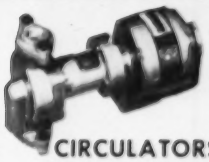
. . .with repeatability, small size, low price features—*Barksdale Valves, Dept. HPAC,* 5125 *Alcoa Ave., Los Angeles* 58.

Recommended by company for



DEPEND ON DUNHAM-BUSH
ONE SOURCE RESPONSIBILITY

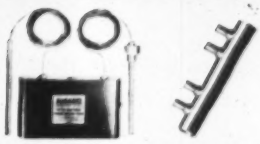
A COMPLETE HOT WATER LINE
Specialties—Convectors
Baseboard—Fin Vector
Unit Heaters—Pumps

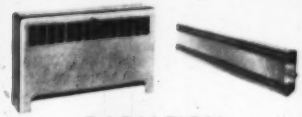

CIRCULATORS
Easy Installation in Minutes

VALVES
Flow Control
Relief and Reducing
Circulator

Balancing ELBOWS and FITTINGS

Automatic AIR VENTS
Float Type Vent
Expansion Type Vent


VARI-FLOW CONTROLS
DISTRIBUTOR HEADS


RADIATION
Convectors
Baseboard

WRITE FOR HEATING EQUIPMENT CATALOG

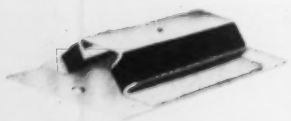
DUNHAM-BUSH

Air Conditioning, Refrigeration, Heating Products and Accessories
DUNHAM-BUSH, Inc. West Hartford 10, Conn., U.S.A.

DUNHAM-BUSH, INC. Dept. HP
West Hartford 10, Conn.
Send me free HEATING EQUIPMENT CATALOG
Name .....
Company .....
Street .....
City ..... Zone ..... State .....

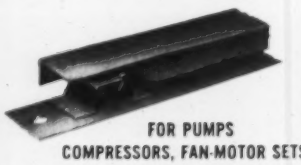
HOW TO ISOLATE VIBRATION IN AIR CONDITIONING SYSTEMS

Here are eight practical solutions to your vibration problems



FOR ALL-PURPOSE USE

These rubber-in-shear vibration mountings are widely used for isolating vibration and noise on air conditioning equipment. Shipped complete, ready to use, their rated load is from 40 to 4000 lbs. Catalog RS-55.



FOR PUMPS COMPRESSORS, FAN-MOTOR SETS

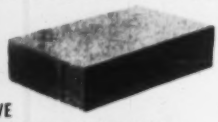
Floating Rail vibration mountings have rubber-in-shear isolators. Rails are tapped and drilled to specification. Bases made for fan-motor sets are shipped complete, ready for installation. Catalog FR-55.

FOR SUSPENDED EQUIPMENT AND PIPING SYSTEMS

Two types of vibration hangers are available: rubber-in-shear (load range: 35 to 1500 lbs.), and steel spring (50 to 1400 lbs.). Both are extremely effective in preventing transmission of vibration from suspended equipment and piping systems. Catalog VH-55.

FOR WATER LINES

The original SOUNDZORBER. Wire-reinforced, wrapped-fabric, rubber pipe widely used for reduction of water line noise and vibration. Working pressures up to 250 psi. Sizes: ½ to 14" ID with I.P.T. male fittings or with full-faced rubber flanges backed up with Series 15 or 30 steel flanges. Catalog SZ-55.



FOR MASSIVE DIFFICULT-TO-ISOLATE EQUIPMENT

ISOLANT is an unusually strong and resilient material which provides excellent isolation of vibration, shock and noise. It is particularly suited for massive air conditioning equipment and similar machinery. Load range: up to 6000 lb. per sq. ft. Catalog IS-55.

FOR HEAVY EQUIPMENT

Steel Spring vibration mountings offer maximum vibration, shock and noise isolation of difficult-to-isolate low-speed machinery, heavy air conditioning equipment, and delicate instruments. Load range: from 100 to 6500 lbs. Catalog SS-55.

FOR FREON LINES

FLEXZORBER, a seamless flexible bronze tubing covered with woven wire braiding, is used to minimize vibration and noise in air conditioning and refrigeration freon lines. Standard copper tube female "slip fittings," welded on both ends, are available from ⅛" to 8" ID. Catalog FZ-55.

FOR STEAM AIR AND GAS LINES

EXPANDZORBER is a stainless steel, welded-diaphragm-type, packless expansion joint used for control of vibration, expansion and contraction in steam, chemical, oil and gas lines. Working pressure from vacuum to 1000 psi at −300 to +1800F. Sizes: ½" to 24" with steel flange or weld end fittings. Catalog EZ-55.

For complete catalog information, write—

FINN

T. R. Finn & Company, Inc., Industrial Division
200 Central Avenue, Hawthorne, New Jersey

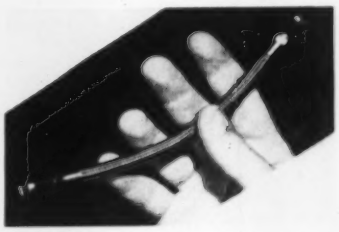
VIBRATION FINNFLEX CONTROL

Industry's most complete line of shock and vibration controls

EQUIPMENT DEVELOPMENTS

Continued

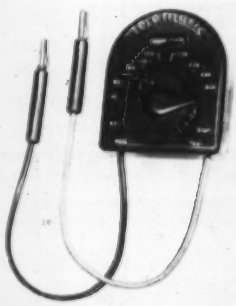
liquid level control, high-low alarm systems, compressor controls. "Meletron" designed to be weather resistant, explosionproof.



Hose Assemblies . . .

. . . designed to answer need for safe, chemical resistant, flexible hose units having "superior" physical properties to rubber or metallic types—*Mic-Lin Co., Dept. HPAC, Rt. 38 at Rudderow Ave., Maple Shade, N. J.*

"Lin-Lok" assembly consists of "Teflon" liner encased in stainless steel wire braid with full flow fittings permanently locked to hose. For pressures to 4000 psi at temperatures —100 to 500 F. In eight sizes 3/16 to 1 ⅛ in. with maximum length of 50 ft.



Voltage Tester . . .

. . . with pocket sized design—*Omega Products, 1700 W. Washington Blvd., Chicago 44.*

For checking voltages 65 to 800, a-c or d-c. Cited use for "Mini-Test" is determining whether voltage is adequate to carry air conditioners.

Polyamide Tubing . . .

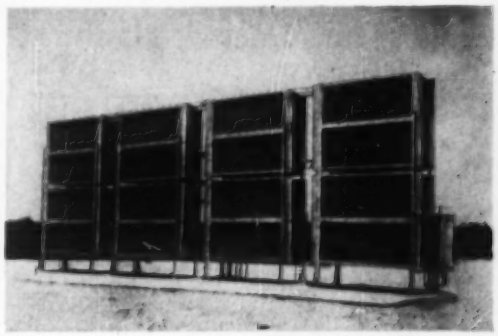
. . . for use on ejector type water pumps—*Polymer Corp. of Pennsylvania, Dept. HPAC, Reading, Pa.*

Crashing the 100 ton barrier

with KRAMER

UNICON

in semi-tropical climate



UNICON SUCCESSFULLY MET THE TEST THROUGH THE SEVERE SUMMER OF 1955

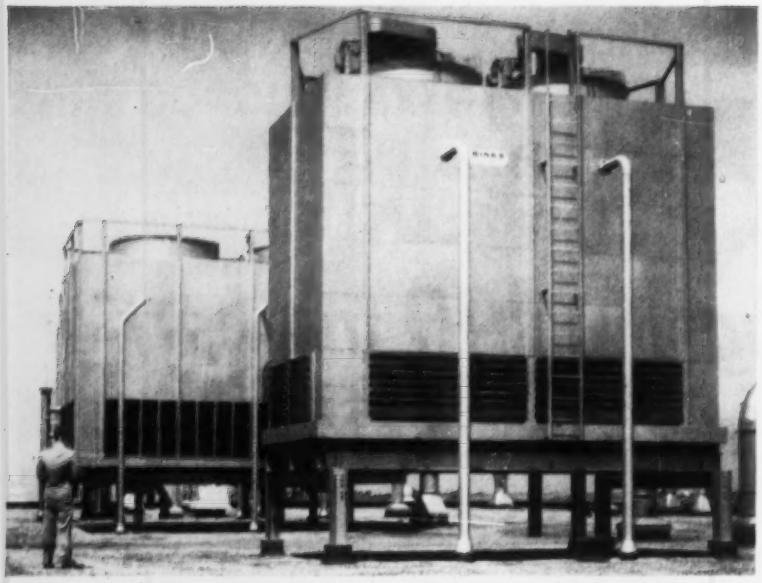
You, too, can crash the big tonnage barriers with UNICON, the industry's finest remote-type air-cooled condenser. Put Kramer's 18 years of "treasured know-how" in the proper use of air as a condenser coolant to work for you.

Photo of Kramer UNICONS mounted on roof of Handy-Andy Supermarket in San Antonio, Texas, used with 100 ton air conditioning system. Supplied through United Supply Co., of San Antonio and installed under the direction of Harold Vogt.

Write for Bulletin U-210-L

KRAMER

KRAMER TRENTON COMPANY
Trenton 5, New Jersey



At the new Caterpillar Tractor plant in Decatur, Illinois, four Binks 2-K Series cooling towers play important roles in the manufacturing processes.

at Caterpillar's Decatur plant

Binks towers keep heat treating under cool control

The tough muscles of steel that make "Cat" motor graders and wheel tractors dependable work horses are no accident. All vital parts go through scientifically controlled heat treat processes.

Binks cooling towers play an important part in this process by controlling the temperature of quenching oils and water. They are also used to cool water that circulates to cool bearings in the electric induction heat treat furnaces.

Failure of the cooling equipment could be costly.

Dependability you can count on

Binks cooling towers are built to rigid specifications. All panels and framework are heavily galvanized and coated for long life and minimum maintenance. Fans are corrosion-resistant aluminum alloy. Scientifically balanced air-to-water ratios give high cooling efficiency under all climatic conditions.

A complete line

Whether it is for cooling process fluids or for use with air conditioning compressors, there's a Binks cooling tower, of the correct capacity and type for every job.

Send for complete data

Ask your Binks branch office for a copy of Bulletin 333 and Bulletin 477-A or write direct to the address below. Binks engineers will be glad to answer your questions and help you solve your cooling problems. There's no obligation.

665

Binks
EVERYTHING FOR WATER COOLING

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

Binks Manufacturing Company
3118-38 Carroll Ave., Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

EQUIPMENT DEVELOPMENTS

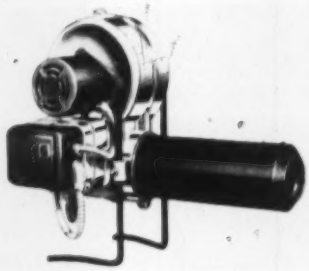
Continued

"Nylaflow" designed to serve as pressure switch tubing between pump case and pressure switch. Is cut to length with sharp knife, installed with standard metal compression rings. Is said to have good, long term resistance to vibration, flexural fatigue.

Pyrometer Kit . . .

. . . containing all parts, components necessary to make complete pyrometer—*Pacific Transducer Corp., Dept. HPAC, 11836 W. Pico Blvd., Los Angeles 64.*

Recommended by company for use in all types of noncorrosive liquids, atmospheres of high heat containers. Kit includes calibrated meter, 6 ft of thermocouple wire, tubular thermocouple well, meter mounting bracket.



Power Gas Burners

. . . for furnaces in small commercial buildings—*Synchronous Flame, Inc., Dept. HPAC, Walworth, Wis.*

"Synchro-Flame" designed for furnaces installed in ceilings, pits, closets, walls. In three sizes, flange or leg mounted with firing range to 400,000 Btu per hr.

Dallas Auditorium Uses 212 FilterFolds

for Air Purification

Unique is the word for Dallas' new civic auditorium—particularly the air conditioning system. Citizens of Dallas, and their convention guests, will enjoy the cleanest, purest air of any public auditorium in the world. This is due principally to the use of 212 FilterFolds—Activated Charcoal air purifiers—installed in the duct work, and capable of handling 218,430 c.f.m. FilterFolds will comb the auditorium air clean of all stuffiness, odors and contaminents, and actually contribute to lower installation and operating costs by allowing maximum recirculation of inside air.

This system underscores again that true air conditioning must include *air purification* as well as usual heating and cooling.

SEND THIS COUPON . . .
. . . for the full story on air purification and recovery with Activated Charcoal FilterFolds.

BARNEBEY-CHENEY

Columbus 19, Ohio St. Johns, Quebec

WORLD'S LARGEST PRODUCER OF AIR PURIFICATION ACTIVATED CHARCOALS FOR HEATING, VENTILATING AND AIR CONDITIONING.

Barnebey-Cheney Co.
Columbus 19, Ohio

Please send additional information on the application of purification in air conditioning.

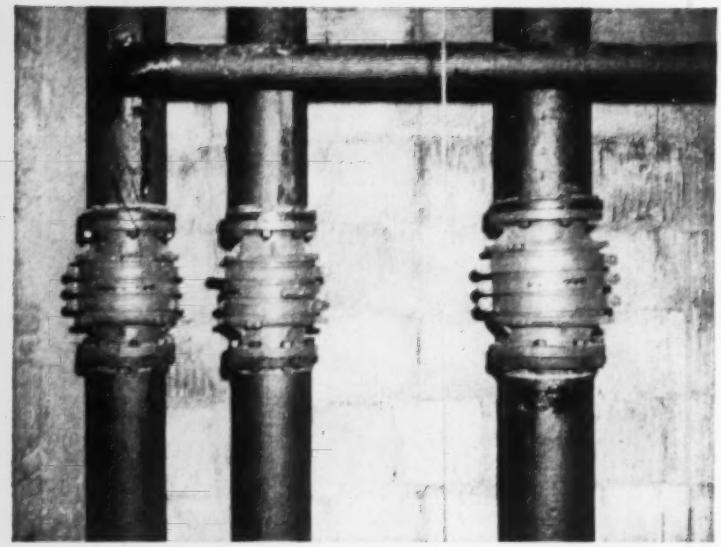
My Name _____

Firm Name _____

Address _____

City _____ State _____

Expansion, Misalignment Problems Solved with Flexon Expansion Joints in Heating—Air Conditioning Piping



FLEXONICS
A Single Source for Every Expansion Joint Requirement

Flexonics Corporation manufactures a complete line of expansion joints in free-flexing, controlled-flexing and special types. Sizes range from 3" up.

Ask for your copy of the Flexon Expansion Joint Design Guide. It provides application and installation data for a wide range of services.

The Flexon Expansion Joints illustrated above are protecting the new heating and air conditioning piping just installed for the Engineering Building, Chicago, Illinois.

During the winter months, the risers shown carry hot water for heating this modern 23 story office building. When summer comes, this same system is utilized for the circulation of chilled water for air conditioning.

These Flexon Expansion Joints are designed for the double duty they perform here and will handle axial movement up to 3". They are rated for pressures to 150 psi and temperatures to 500° F. They also compensate for misalignment in piping.

Flexon Expansion Joints can protect your piping from the dangerous stresses of thermal motion and misalignment which could eventually result in piping failure.

They are manufactured by pioneers in the fabrication of corrugated metal assemblies with over 54 years of experience. For routine or unusual applications, play it safe, specify Flexon Expansion Joints.

SEE US AT THE POWER SHOW — BOOTH 346

E12C

FLEXON® QUALITY
proved in service and backed by over 54 years manufacturing experience

Flexonics *Corporation*
EXPANSION JOINT DIVISION
1391 S. THIRD AVENUE, MAYWOOD, ILLINOIS
FORMERLY CHICAGO METAL HOSE CORPORATION
Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

RECENT TRADE LITERATURE . . .

▸ *ACTIVATED CHARCOAL*—Catalog tells how activated charcoal can be used for air recovery, odor removal, air purification, food preservation, and as solvent recovery. Sections deal with equipment, applications, charcoal itself. *Pur Air Div., Barnebey-Cheney Co., Dept. HPAC, Columbus 19, Ohio.*

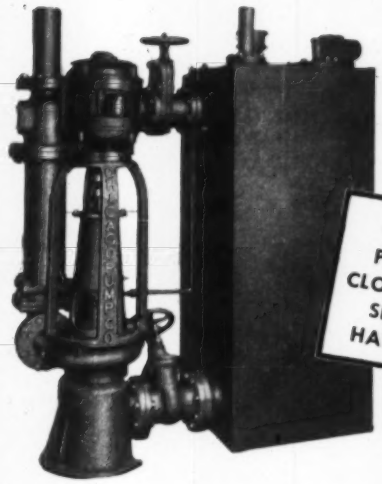
▸ *AIR COOLING UNITS*—New 12 page bulletin No. 185-H details line of air cooling units. Includes photographs, dimensional drawings, descriptions. Units recommended by company for cold storages, chilling and processing rooms, quick-freezing and other low temperature work. *Frick Co., Dept. HPAC, Waynesboro, Pa.*

▸ *AIR POLLUTION*—Four page article, *Tools and Techniques in Air Pollution Control*, describes methods available for study of various aspects of air pollution which are part of consultation service offered by company. Includes discussions of pilot scale research; tall stack dispersion; new plant surveys; dust collector, fly ash arrestor acceptance tests; particle size measurements; stack emission surveys; stack gas tracer studies. *Hemeon Assoc., Dept. HPAC, 121 Meyran Ave., Pittsburgh 13.*

▸ *BOILERS*—Catalog No. 819 describes, illustrates "Queen of Scots" wet back boilers for use with oil, gas, gas-oil forced draft burners. Companion catalog, No. 820, lists and reviews model for oil or gas firing with natural draft. *Heating & Air Conditioning Div., National-U.S. Radiator Corp., Dept. HPAC, Johnstown, Pa.*

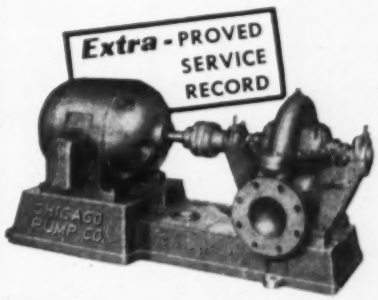
▸ *CONDENSERS*—New "Dri-Fan" condenser catalog 300.6a for both fluorinated hydrocarbon refrigerants and ammonia features new additions not contained in previous catalog.

these "Extras" in CHICAGO PUMPS mean Longer, Better Performance Lower Cost Operation and Installation



FLUSH-KLEEN Sewage Ejector TYPE "S"

The Flush-Kleen Sewage Ejector can't clog because only liquid is handled by the impeller. Coarse matter is strained out, then backwashed from the strainer into discharge pipes. No strainer baskets to clean, no repairs due to clogging, no foul basins because solids never reach the wet basin. Besides being easier to maintain, Flush-Kleens last longer and require less power. Write for details in Bulletin 122C.



DOUBLE SUCTION HORIZONTALLY SPLIT CASE PUMP

Accurately machined and fitted revolving parts in carefully cast casing. Have proved reliable for house pump, circulating and booster service. See Bulletin 101.

TYPE AVC CONDENSATION PUMP AND RECEIVER

Low inlet — no elaborate foundation needed for installation — for systems to 10,000 EDR and 10-30 psi. See Bulletin 245.

A COMPLETE LINE FOR EVERY BUILDING SERVICE

NEW F-C AND C-C PUMPS EITHER FLEXIBLE-COUPLED OR CLOSE-COUPLED

Compact, smooth running, quiet, — ceramic faced seal is highly resistant to wear — for circulating and booster service. Heads from 10 to 190 feet, capacities from 5 to 400 gpm. Bulletins 107 and 108.

SURE-RETURN CONDENSATION PUMP AND RECEIVER

Low inlet — positive head on suction — no friction in manifold between pump and receiver — handles extremely hot condensate without steam binding — for systems to 75,000 EDR and low or medium pressures. See Bulletin 250.

Write to Department B

For additional information on any of the above pumps, specify by bulletin number.

fmc CHICAGO PUMP COMPANY
Subsidiary of Food Machinery and Chemical Corporation
BUILDING PUMP DIVISION
660 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems, Flush Kleen ® Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every industrial use.

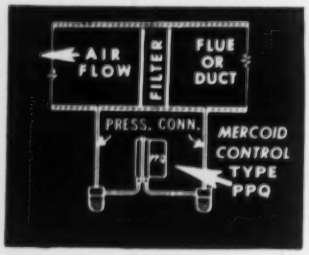
EXTREMELY
"Sensitive"
DIFFERENTIAL PRESSURE
Control
BY
MERCOID®

Has Hermetically Sealed
Magnetic Mercury Switch

FOR AIR OR GAS
(INCHES OR FRACTION OF INCHES OF WATER)

For low pressure or vacuum—to "make" or "break" electrical circuits on small changes in the difference between two pressures. Examples: to indicate a change in resistance through a filter (see illustration); to indicate a change in differential due to a change in air flow conditions; to indicate interruption of air flow.

This control incorporates two pressure chambers separated by a sensitive diaphragm. Each chamber is connected to a separate pressure source and the control is set to operate as the relationship of the two pressures change.



OPERATING RANGES—6" vacuum to 6" pressure (sensitivity .03") and 30" vacuum to 30" pressure (sensitivity .1" to .2").

CIRCUIT ARRANGEMENTS—several models available to accomplish the following operations:

SPST—USING ONE MAGNETIC SWITCH—open or close switch contact either on an increase or decrease at pressure difference.

SPST—USING TWO MAGNETIC SWITCHES FOR TWO STAGE OPERATION. Open/close both switch contacts on an increase in pressure difference.

Open one contact on increasing pressure difference and one on decreasing pressure difference.

Close one contact on increasing pressure difference and one on decreasing pressure difference.

CASE STYLES—three types to meet following conditions: Indoor (general purpose), Outdoor (weather resistant), and Hazardous locations (explosion-proof).

WRITE FOR BULLETIN No. 14N

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

RECENT TRADE LITERATURE

Continued

Also included are capacity tables, dimensions, fan tables, information on desuperheat coils, typical specifications. *Refrigeration Engineering, Inc., Dept. HPAC, 7250 E. Slauson Ave., Los Angeles 22.*

▶ *CONVERTORS*—U-tube steam-to-water convertors described in 12 page bulletin No. 50. Capacity tables arranged to allow easy determination of convertor size. Units for radiant heating applications listed separately. *Davis Engineering Corp., Dept. HPAC, 1064 E. Grand St., Elizabeth, N.J.*

▶ *COPPER TUBING HANGERS*—Hangers, supports for copper tubing presented in catalog CTH-56. Literature contains illustrations, descriptions, tables as to loads, dimensions, weights, packaging for each product in line. *Grinnell Co., Inc., Dept. HPAC, 260 W. Exchange St., Providence 1, R.I.*

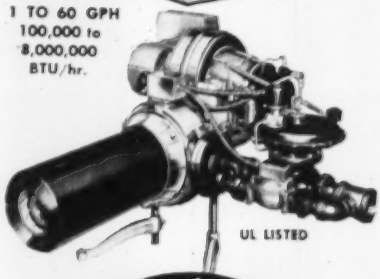
▶ *DUST COLLECTORS*—Cleaning of ordinary atmospheric air by means of specially adapted industrial cloth-filter-type dust collectors described in 4 page bulletin 557-D. Literature contains two case histories of installations where this process is used. *Wheelabrator Corp., Dept. HPAC, 343 S. Byrkit St., Mishawaka, Ind.*

▶ *ENGINEERING SERVICE*—Company's design service for specifying, fabricating equipment such as heat exchangers, chlorine coolers, towers, etc., described in 4 page bulletin. *Haveg Corp., Dept. HPAC, 900 Greenbank Rd., Wilmington 8, Del.*

▶ *EVAPORATOR PRESSURE REGULATING VALVE*—Bulletin illustrates, describes "Model 235S" evaporator pressure regulating valve. Unit redesigned to incorporate operating, construction improvements, says company. *Controls Co. of America, A-P Controls Div., Dept. HPAC, 220 N. 31st St., Milwaukee 45.*

DUAL FUEL SITUATIONS NEED EXTRA THOUGHT

1 TO 60 GPH
100,000 to
8,000,000
BTU/hr.



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In those situations where you can take advantage of off-peak gas rates, it is often possible to reduce heating costs substantially. The SYNCRO/FLAME Dual Fuel Burner is designed *especially for such circumstances.* Various distinctive features have been incorporated, to provide *outstanding performance.* One of these is . . .

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He'll solve any problems you have in this category. You name your requirements and he'll ship the sizes you need in the analyses the job calls for.

You can get Republic ELECTRUNITE Stainless Steel Pipe in types 304, 304-L, 316, 316-L, 321 and 347—plus other analyses. Continuous welded sizes from ⅛" I.P.S. through 2" I.P.S. in A.S.A. schedule 40S; from ⅛" I.P.S. through 4" I.P.S. in schedule 10S; and from ½" I.P.S. through 4" I.P.S. in schedule 5S wall thicknesses. Larger sizes up to 30" also available. Republic Stainless Steel Tubing is also available in a complete range of sizes and analyses.

It doesn't matter how the pipe or tubing have to be joined. Republic ELECTRUNITE Stainless Steel Pipe can be welded, threaded or used with compression fittings. And for your positive identification Republic ELECTRUNITE is clearly stenciled the full length with the type, heat number and specification. It can be easily identified no matter where it's cut.

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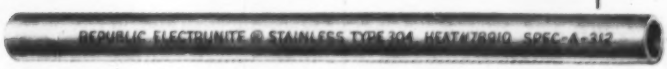

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RECENT TRADE LITERATURE

Continued

▸ *FAN MOTORS*—Construction features of "Type KCP" permanent split capacitor fan motors for room air conditioners presented in 8 page bulletin GEA-6533. Literature includes "Design Engineer's Corner" which cites motor's speed versatility, low temperature rise, high power factor, other features. *General Electric Co., Dept. HPAC, Schenectady 5, N.Y.*

▸ *FLAT GLASSES*—Properties, applications, characteristics of company's flat glasses presented in 4 page bulletin PE-34. Technical data furnished on "Pyrex" polished plate glass, "Vycor" flat glass, "Corning" heat resistant blue observation glass, "Pyrex" infrared reflecting glass. *Corning Glass Works, Dept. HPAC, Corning, N.Y.*

▸ *FLEXIBLE CHAIN COUPLINGS*—Specifications, dimensions, ratings, applications for silent chain couplings, roller chain couplings given in 16 page catalog CA5-56. Pertinent information also tabulated on stamped steel covers, plastic covers, split aluminum covers. *Morse Chain Co., Dept. HPAC, Ithaca, N.Y.*

▸ *FLUID DRIVES*—New 16 page bulletin 9119 covers "Gyrol" fluid drives for ½ to 25 hp applications. Describes various types for industrial use in low horsepower range. Explains fluid drive principle, outlines advantages of company's units. *American Blower Corp., Dept. HPAC, Detroit 32.*

▸ *FORCE TRANSDUCERS*—Two page bulletin No. 140 describes proving ring force transducers. Included are theory of operation, applications information, photographs, electrical and physical specifications. Units recommended by company for dynamic or static measurement, control involving force, stress, weight, torque, similar quantities. *Daytronic Corp., Dept. HPAC, 216 S. Main St., Dayton 2.*

▸ *FUEL OIL HEATER*—Bulletin 60-N lists features for "Paracoil Thermofilm" fuel oil heater. Contains dimensional drawing, piping installation drawing, table of capacities, dimensions, weights. *Davis Engineering Corp., Dept. HPAC, 1064 E. Grand St. Elizabeth, N.J.*

▸ *GAS CONVERSION BURNERS*—Bulletin describes line of multiple jet rectangular gas conversion burners ranging 50,000 to 2,100,000 Btu per hr. Lists specifications, dimensions, features. *Barber Mfg. Co., Gas and Oil Burner Div., Dept. HPAC, 1052 E. 134th St., Cleveland 10.*

▸ *GASKETS, SHIMS, WASHERS*—New 28 page catalog illustrates, describes gaskets, shims, washers in variety of styles, shapes, materials. Includes data on ring, cylinder head, double jacket, corrugated metal, plain

HOW DOREX STOPPED THE TROUBLE A-BREWING

Scene: A famous Brewery. Neighboring plants include a copper mill, paint factory and paper mill—all contributing to a localized air pollution problem.

Problem: Beer flavor was being affected by polluted air. So much so that when the wind was in a certain direction, the brewery was forced to suspend operations—sometimes for days at a time.

Solution: Dorex Air Recovery was installed in the air conditioning system to purify air coming into the bottling room. This proved so successful that a second Dorex installation was made in the chilling room to prevent possible contamination at that point. *Dorex has completely eliminated shutdowns due to air pollution.*

If your operations require pure uncontaminated air, investigate Dorex Air Recovery. In addition to clearing up the immediate problem, Dorex can also substantially reduce costs of installing and operating an air conditioning and ventilating system. Write us for full information. Connor Engineering Corporation, Dept. A-126, Danbury, Connecticut.

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It's a sure thing! Your heating, air conditioning and refrigeration equipment will deliver dependable, *peak performance over the years*, when you fabricate with Chase Type L copper tube!

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RECENT TRADE LITERATURE

Continued

solid, self sealing, and special types of gaskets. Section lists more than 1500 stock dies available. *Chicago-Wilcox Mfg. Co., Dept. HPAC, 7701 S. Avalon Ave., Chicago 19.*

▸ *INSTRUMENTATION*—Bulletin G-2 is index of literature available from company. Covers catalogs, bulletins, specification sheets, data sheets, illustrated lectures. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▸ *MECHANICAL, ELECTRICAL PRODUCTS*—Catalog No. 12 covers more than 400 items in company's line, including new plastic screw anchor kit, wire connectors, metal straps, fish tape winder, and tool designed for smoothing and beveling freshly cut ends of thin wall conduit. *Holub Industries, Inc., Dept. HPAC, Sycamore, Ill.*

▸ *MERCURY PLUNGER RELAYS*—File folder contains information on line of mercury plunger relays, related products. Includes load ratings and contact data, coil characteristics, diagrams and illustrations, general information. *Ebert Electronics Corp., Dept. HPAC, 212-31R Jamaica Ave., Queens Village 28, N.Y.*

▸ *MOTORS*—Design features of open dripproof motors in NEMA re-rated ratings of ½ to 40 hp, old ratings of ½ to 100 hp described in bulletin 51B6210G. In addition to cutaway views of motor, bulletin includes tables of ratings and dimensions, horsepower frame chart. *Allis-Chalmers Mfg. Co., Dept. HPAC, 1171 S. 70th St., Milwaukee 1.*

▸ *OIL MIST PRECIPITATORS*—Purpose, applications, benefits, principles of operation, general construction features, installation possibilities for oil mist precipitators in horizontal, vertical air flow types described in 4 page folder. Includes dimensional drawings with table. *Electro-Air Cleaner Co., Dept. HPAC, 1285 Reedsdale St., Pittsburgh 33.*

▸ *PACKAGED BOILERS*—New 4 page bulletin No. 1233 describes "Power-Pak" packaged automatic boilers for steam or hot water heating, hot water service. Units available in capacities 8 to 25 hp, for pressures to 15 psi. Literature illustrates oil, gas fired units; lists features, advantages; tabulates dimensions, weights, ratings. *Orr & Sembower, Inc., Dept. HPAC, Reading, Pa.*

▸ *PIPE, TUBING, WELDING FITTINGS*—Technical data card 116-A covers "Croloy" steel pipe, tubing, welding fittings. Provides condensed data on mechanical properties, creep strength, physical properties, hot and cold bending, welding, heat treatment, working pressure. *Babcock & Wilcox Co., Tubular Products Div., Dept. HPAC, Beaver Falls, Pa.*

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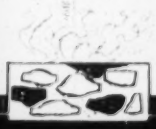

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Flush or extended models, also dampers and installation rings

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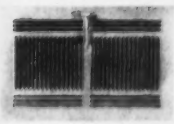
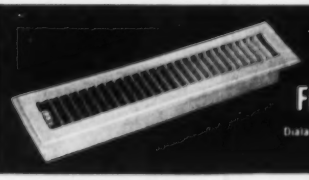


NEW! B-24 PERIMETER BASEBOARD DIFFUSERS

Adjustamatic finger tip damper control, built in damper



PH SERIES PERIMETER FLOOR REGISTERS

Dialamatic control, set screw for easy balancing

...with this complete line of Standard Stamping Registers!

These four Standard Stamping Registers enable you to select the air pattern best suited to the size, shape, and use of every room served by a combined heating-cooling system. They're easier to install, trouble free, and give every two-way system perfect air distribution without blasts, hot spots or cold corners! Get the facts about them now!

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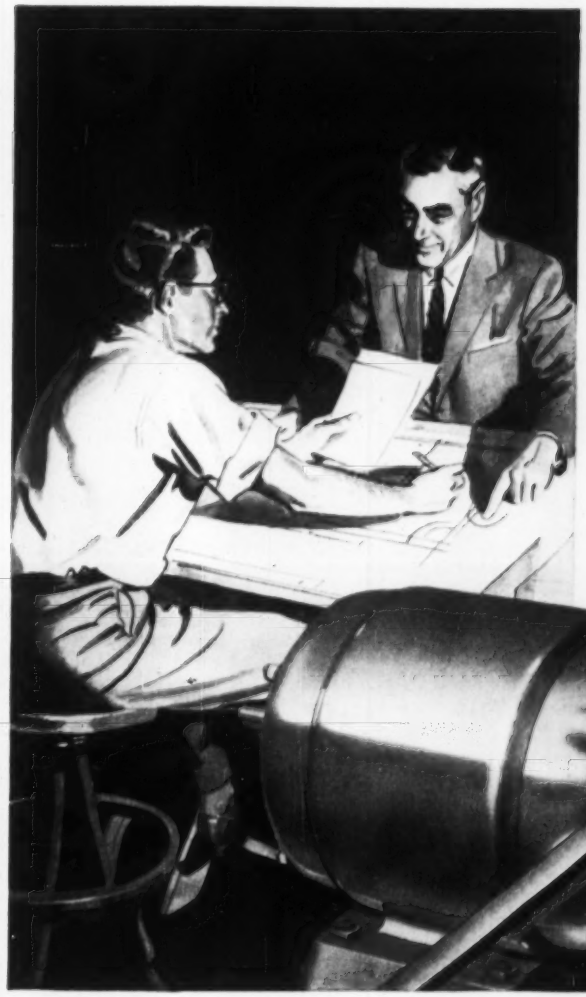

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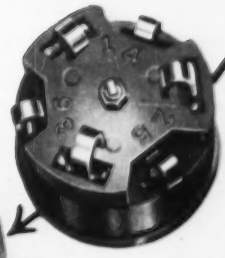
3-Phase Motors



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For years motor manufacturers have looked to Klixon Protectors for the best inherent protection in single-phase motors. Now this same dependability can be built into your 3-phase motors — covering a horsepower range from fractional up through 7½ hp. (600 V.)

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RECENT TRADE LITERATURE

Continued

▸ *PIPING*—Four page form No. 2190-3 contains eight steam piping diagrams. Engineering data includes table listing steam supply and return pipe sizing recommendations. *Young Radiator Co., Dept. HPAC, Racine, Wis.*

▸ *POWER EXHAUSTER*—Axial mushroom power exhauster detailed in bulletin CAM-103. Literature contains performance tables, illustrations, application information. Exhauster has fan designed to exhaust 350 to 34,430 cfm of fumes, smoke, dust with minimum of noise. *Chicago Blower Corp., Dept. HPAC, 9363 Pacific Ave., Franklin Park, Ill.*

▸ *PREFABRICATED PIPING*—New 28 page catalog No. 100 describes "Elco" prefabricated insulated piping systems (underground and overhead) for steam, condensate, hot or chilled water, other fluids. Gives information on design, applications, installation of systems, including technical data. *E. B. Kaiser Co., Dept. HPAC, 2114 W. Lake Ave., Glenview, Ill.*

▸ *PRESSURE REDUCING VALVES*—Use of high pressure reducing and relief valves in plastics molding operations described in new brochure MMR-56. Discusses installation, operation of valves in plastics molding plant where initial pressures of 5000 psi have to be closely controlled at much lower pressures for molding of "Bakelite," other plastics material. *Atlas Valve Co., Dept. HPAC, 230 South St., Newark 5.*

▸ *PRESSURE, TEMPERATURE CONTROL*—New 4 page bulletin 979 contains technical specifications for "Type 57" pneumatic recording controller, "Type 58" recorder. For pressure ranges 0-5 to 0-25,000 psi, temperatures —350 to 1200 F. *A. W. Cash Co., Dept. HPAC, P.O. Box 551, Decatur, Ill.*

▸ *PRESSURE TRANSDUCERS*—Data sheet No. 10.2-6 describes transducers, manufactured by H. E. Sostman & Co., which respond to linear or nonlinear functions of pressure to position a pen or pointer through self balancing bridge circuit. Recommended by company for such variables as absolute, differential or gage pressure, level, flow. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▸ *PROCESS CONTROL*—Pneumatic instruments for process control discussed in 16 page catalog No. 505. Covered are indicating pilots, transmitters, receiver gages. Highlighted is new 3½ in. scanning diaphragm receiving gage. *United States Gauge, Div. of American Machine and Metals, Dept. HPAC, Sellersville, Pa.*

▸ *PVC PIPE, FITTINGS, VALVES*—Data about "Van-Cor" line of unplasticized polyvinyl chloride pipe,

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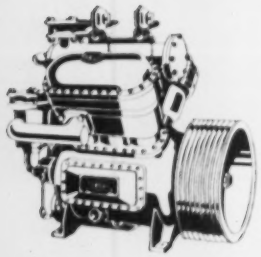
Air Conditioning Serves Throughout this Unique Hotel



Nine Frick "ECLIPSE" Compressors Air-Condition the Claypool Hotel at Indianapolis

Famed as the first COMPLETELY air-conditioned large hotel north of the Mason-Dixon Line, the Claypool at Indianapolis selected Frick equipment because it had used Frick Refrigeration for food service since 1939.

Nine Frick "ECLIPSE" compressors, installed by Decker and Roberts of Fort Worth, carry the air conditioning load, which is divided into three systems.

You get the utmost in air conditioning, ice making, quick freezing and cooling services when you specify "Frick." Let us quote now on your commercial or industrial cooling needs.

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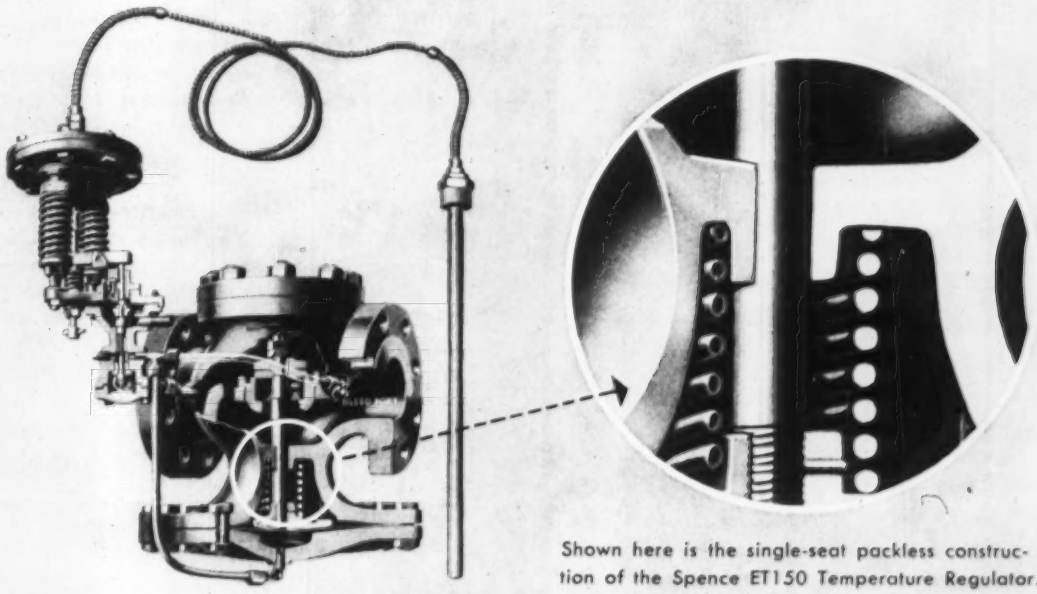
VALVE TIPS:

Advantages of Packless Construction in Temperature Regulating Valves



Shown here is the single-seat packless construction of the Spence ET150 Temperature Regulator.

One of the biggest headaches in regulating valve maintenance is repacking stuffing boxes.

How often a valve needs repacking, how much time it takes, and the cost of the system downtime all vary with the construction of the regulator and the service it's used for. No matter how you calculate all these variables it's still a headache—and an expensive one.

In the temperature regulator shown above (Spence Type ET150) stuffing boxes are eliminated. This is done by what is known as "balanced" diaphragm construction. You can see in the cutaway drawing that pressure is applied to both sides of the large metal diaphragm. The upper side is exposed to delivery steam pressure and the lower side is exposed to loading pressure applied by the pilot. When the pilot closes, both delivery pressure and loading pressure are equalized through the bleedport and connecting tubing.

This construction not only does away with repacking problems, but it makes possible additional savings as well. For example, you will note in the sectional blow-up that this design eliminates a closely fitted stem and guide. Dirt or other foreign matter doesn't have much of a chance to lodge between these parts and cause sticking.

Another cause of binding or sticking, uneven expansion of closely fitted parts, is also eliminated with this design. In addition, valve stem wear is reduced for the same reason.

Lower maintenance is not the only advantage of this packless construction. Accuracy of regulation is also improved because friction due to a stuffing box, dirt, or uneven expansion is not a problem. The large, *balanced* metal diaphragm is more sensitive to slight changes in pressure.

Guaranteed Not To Wiredraw

If seats and discs are cut by steam (wiredrawn) the loss of steam through these grooves can be another expensive item — directly charged against the regulating valve. Fortunately, you can eliminate these costly leaks by specifying a temperature regulator that is *guaranteed not to wiredraw*.

Spence makes such a guarantee because their seats and discs are made of SECO Metal. Over 20 years experience with this special alloy has failed to produce a single case where a SECO Metal seat or disc had been cut by steam. All that's required is an approved strainer located ahead of the regulating valve. Expensive steam leaks just can't happen with this combination of SECO Metal and single-seat design.

If you would like to have more information on Spence Temperature Regulators, drop us a line and ask for Bulletin T150. It gives more detailed information on these and other Spence design features. Piping layouts and helpful information on the installation of temperature regulators are also included. Write for your copy today.

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

SE 140

FURNAS ELECTRIC CONTROLS

do the best job for AIR CONDITIONING and REFRIGERATION

SAVE WITH *"In-Between"* SIZES

Instead of just 5 Magnetic Starters in the 1 to 100 hp range, Furnas Electric offers you 9 sizes—the 5 standard sizes plus 4 "in-between" sizes. The many "in-between" sizes in the Furnas Electric line allow you to choose the control that is best suited for your particular job—at a saving to you in cost, space and capacity.

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BATAVIA, ILLINOIS

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RECENT TRADE LITERATURE *Continued*

fittings, valves given in 16 page engineering catalog. Literature covers normal impact and high impact types. *Colonial Plastics Mfg. Co., Dept. HPAC, 2685 E. 79th St., Cleveland 4.*

▸ *RADIATION PYROMETERS*—Catalog C 93-1 describes "Radiamatic" pyrometers. Included is new sapphire rod unit, developed primarily for checking temperatures in boilers, heat exchangers through view panels with average speed of response of less than 0.5 sec for 90 percent change in temperature. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▸ *ROOF VENTILATOR*—Exhaust performance capabilities, fire fighting features of jet axial roof ventilator described in bulletin VA-101. Unit designed for high efficiency in exhausting heat, smoke, dust, fumes at low rpm. *Detroit Blower Co., Dept. HPAC, 9867 Pacific Ave., Franklin Park, Ill.*

▸ *SEAMLESS, WELDED PIPE*—Technical data card 133-B has tables listing dimensions, weights, specifications, grades, analyses for company's carbon, alloy and stainless steel seamless and welded pipe. *Babcock & Wilcox Co., Tubular Products Div., Dept. HPAC, Beaver Falls, Pa.*

▸ *SOLIDS-CONTACT REACTORS*—Bulletin 5001, 24 pages, describes company's solids-contact reactors. Plan, elevation drawings show variety of designs available. Literature discusses theory, problems of cold water clarification, as well as advantages, applications of various designs. *Cochrane Corp., Dept. HPAC, 17th St. below Allegheny Ave., Philadelphia 32.*

▸ *SQUARE DUCT CORNERS*—Catalog F-7912 covers "Uni-Flo Airturn" factory fabricated, ready to install air turning device designed to give sweeping radius performance to square duct corner. Catalog includes pressure loss data which permits engineers to determine true elbow losses throughout air distribution system, says company. *Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

▸ *THERMOMETER*—Test instrument said to be capable of full scale indication on 1 sec surface contact described in form 2P756. "Pyro-Couple" illustrated in use. Drawing, list of specifications and features included. *Royco Instruments, Dept. HPAC, 797 Arthur St., Albany, Calif.*

▸ *THERMOSTATS*—Bulletin MC-137 describes two types of "Thermoswitch" units which are encased in

Fits like a glove

PETRO firing unit with everything built in, balanced and factory tested

Phantomed area shows the Petro package unit (assembled at factory on its own base) fitted to boiler front. Refractory burner throat is part of the burner.

The PETRO package includes an oil or gas burner *(or combined gas-oil)*; a factory-wired control panel; forced draft air supply and a built-in fuel system—ALL IN A SINGLE INTEGRATED UNIT

This is not a simple conversion burner—it's a complete combustion system. Everything that goes into an ultra-modern firing system is right here, mounted on a rigid steel frame and ready to go. All of the intricate wiring and electrical controls are factory assembled, installed, and tested. Every component is engineered for the job, in the proper size, capacity, and type. Nothing is left to on-the-job improvising.

And best of all from *your* standpoint, a single unit means single responsibility. It's a Petro job from beginning to end and Petro is proud to back it up. It has all the sturdy qualities that have made Petro famous for DEPENDABILITY.

The Petro forced draft burner is suitable for firing all types of boilers, or can be purchased as a complete boiler-burner unit with matched Scotch type Titusville or Kewanee boiler.

Coupon will bring full information and specifications.

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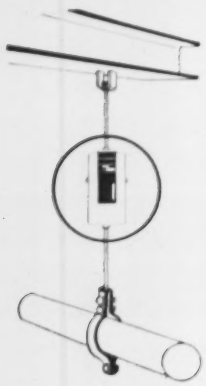
PIPE HANGERS

FOR

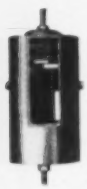
HEATING — PLUMBING
POWER & PROCESS



- Rugged
- Compact
- Simple in design and installation
- Indispensable for systems operating at changing temperatures

FIG. 401

SPRING HANGER



Our catalogue illustrates a complete line of Pipe Hangers & Supports and is an indispensable reference book for engineers, contractors, estimators & erectors. Write for your copy now.

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RECENT TRADE LITERATURE

Continued

plastic for service in highly humid or corrosive environments. Units are standard cartridge type and lower cost rectangular model. *Fenual, Inc., Dept. HPAC, Ashland, Mass.*

▸ *THREAD SEALING, ANTI-SEIZE COMPOUND*—Use of "Teflon" as thread sealing and anti-seize compound for metal, plastic, carbon systems and equipment described in new bulletin. Included are typical applications in chemical, petroleum, nuclear and process equipment industries. *Eco Engineering Co., Dept. HPAC, 12 New York Ave., Newark 5.*

▸ *TUBING FITTINGS*—Catalog illustrates, describes new line of SAE fittings, o-ring adapters designed to satisfy new SAE straight thread boss standards. Also shown are new tube nuts available in short nut, SAE long nut, three-piece assembly styles. *Anchor Coupling Co., Inc., Dept. HPAC, 325 N. Fourth St., Libertyville, Ill.*

▸ *VALVES*—Brochure No. S-2021 R contains illustrations, technical information on company's line of valves. *Circle Seal Products Co., Inc., Dept. HPAC, 2181 E. Foothill Blvd., Pasadena, Calif.*

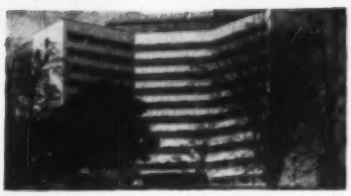
▸ *V-BELTS*—Construction features of "Texrope" grommet v-belt which are said to provide longer life described in bulletin 20B6497C. Belt is said to have less shrinkage and stretch, run cooler and grip better. *Allis-Chalmers Mfg. Co., Dept. HPAC, 1171 S. 70th St., Milwaukee 1.*

▸ *VITRIFIED CLAY PRODUCTS*—Specifications, dimensions for company's range of vitrified clay products presented in 4 page technical bulletin. *Robinson Clay Product Co., Dept. HPAC, Akron 9, Ohio.*

▸ *WATER CONDITIONING*—"Scav-Ox" hydrazine solution for removing dissolved oxygen from boiler feedwater described in 16 page bulletin. Details use of solution for protecting low, medium, high pressure boilers. Discusses determination of dosage, recommended methods of application, testing methods, properties, handling. *Olin Mathieson Chemical Corp., Industrial Chemicals Div., Dept. HPAC, Baltimore 3.*

▸ *WATER GAGES*—"Yarway Color-Port" water gages for boilers to 3300 psi described in 6 page bulletin WG-1814. Literature gives details on design and operation, shows how port type arrangement and two-color readings give greater visibility, reduced maintenance requirements, says company. *Yarnall-Waring Co., Dept. HPAC, Mermaid Ave., Philadelphia 18.*

Specify RECO



Rhode Island Hospital, Providence, R. I.
Shepley, Bulfinch, Richardson & Abbott - Architects & Engineers
Merrill Associates - Heating, Ventilating and Air Conditioning Engineers
Elhatton Plumbing & Heating Co. - Plumbing Contractor
W. B. Parsons Co. - RECO Representative, Needham, Mass.

On Call Around the Clock... Hot Water by RECO!

RHODE ISLAND HOSPITAL's new 452 bed Main Building relies on RECO Hot Water Storage Heaters for plenty of hospital-pure hot water. Made of tough, rust-proof copper silicon, these RECO storage heaters were ASME built and tested to *deliver over 10,000 gallons of 180° hot water* per hour, every hour. And RECO guarantees this performance.

Make the RECO guarantee of top quality, fair price and quick delivery a part of your next heating job. SPECIFY RECO.

Write today for free catalogs, plus name of RECO representative nearest you to: Dept. L, Richmond Engineering Co., Inc., 7th & Hospital Sts., Richmond, Va.

RICHMOND ENGINEERING CO., INC.

For Low-Cost Heating Plant Exhausting and Industrial Venting ...Investigate **Quickdraft**

Capacities of 56 standard and heavy duty models (6 to 30-inches diameter) . . . 140 CFM to 16,766 CFM with or without stacks. Greater capacities on special order.

★ NEW ACID-RESISTING FINISHES
★ NO FAN OBSTRUCTION IN EXHAUST LINE
★ BLOWER OPERATES IN CLEAN OR OUTSIDE AIR
★ CAN BE USED WITH OR WITHOUT STACK

FOR HEATING PLANTS AND INCINERATORS. Quickdraft provides constant draft required for efficient and economical combustion. It prevents noxious concentrations of deadly fumes and dangerous accumulations of explosive gases from escaping into buildings. It eliminates pulsating or chattering, puffing, smoking and sooting. Quickdraft's acid-resisting vitreous enamel finish assures trouble-free performance.

FOR INDUSTRIAL VENTING. Quickdraft eliminates down-time for cleaning and replacing fan blades . . . cuts maintenance costs. It is ideal for venting paint booths . . . abrasives, corrosive gases, noxious fumes, high temperatures and moisture. For severe exposure to acids, specify our new acid-resisting plastic finish in addition to our standard acid-resisting vitreous enamel finish.

FOR MOVING AIR . . . in or out of buildings through ducts . . . Quickdraft is outstanding in efficiency.

Send for engineering data on your heating or venting applications . . . today.

N-394-QD

Quickdraft COMPANY

Dueber-Hampden Building, P. O. Box 87-K Canton 1, Ohio

WHO'S WHAT...

(New personnel, promotions)

▸ *AIR MOVING & CONDITIONING ASSOCIATION*—Chairmen and vice chairmen for product divisions are: Central station air conditioning division—chairman: F. W. McKenna, chief engineer, Kennard Corp.; vice chairman: L. A. Macrow, manager of systems and equipment department of Machinery and Systems Div., Carrier Corp. Centrifugal fan division—chairman: R. A. Wasson, vice president and general manager, Clarage Fan Co.; vice chairman: E. W. Peterson, vice president of sales, American Blower Corp. Industrial axial and propeller fan division—chairman: E. C. Englert, sales manager, Hartzell Propeller Fan Co.; vice chairman: M. L. Aitken, general sales manager, Robbins and Meyers, Inc. Power roof ventilator division—chairman: J. P. Johnson, sales manager, ventilating division, Swartwout Co.; vice chairman: W. Rutter, chief engineer, Burt Mfg. Co. Unit heater division—chairman: T. L. Arnold, sales manager, heating division, Fedders-Quigan Corp.; vice chairman: J. J. F. Merrick, division sales manager, John J. Nesbitt, Inc. Messrs. McKenna, Englert, Johnson and Arnold have been elected directors of the association.

▸ *AIR-CONDITIONING AND REFRIGERATION INSTITUTE*—William A. Bours, III, a director. Mr. Bours is assistant director of sales of "Kinetic" Chemicals Section of E. I. du Pont de Nemours & Co.

▸ *RELIANCE ELECTRIC & ENGINEERING CO.*—Edward E. Helm, president. James W. Corey, resigning as president, was made chairman of the board of directors.

▸ *BABCOCK & WILCOX CO.*—Alfred Iddles, president for forthcoming year of Atomic Industrial Forum, Inc. Mr. Iddles is president of Babcock & Wilcox.

▸ *JOHNSON SERVICE CO.*—William P. Chapman, appointed to executive staff of engineering department. Mr. Chapman's duties will include major assignments in connection with company's research and development program.

▸ *ADSCO INDUSTRIES, INC.*—Richard G. Lyall, vice president in charge of engineering.

▸ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—Jack H. Smith, Director of Copper Div., Business Defense Services Administration, U.S. Department of Commerce. Mr. Smith, Wolverine's east-

Right to left: John Morrill, General Manager—Don Wood, General Sales Manager—Al Wirick, Manager of Manufacturing—Clyde Ploeger, Director of Engineering—Bill Aufsebrook, Manager, Quality Control—Hardy Austin, Superintendent, Production—John Downen, Service Manager—Clarence Martin, Supervisor, Order Department—Henry Preher, Chief Application Engineer

NEW TEAM IN THE COMPRESSOR LEAGUE!

There's a new big-league team in the compressor business—Bendix-Westinghouse Evansville Division.

While our parent company, Bendix-Westinghouse Automotive Air Brake Company, has been for twenty-five years the leading supplier of precision compressors to the automotive industry, our division here at Evansville, Indiana, is a brand-new entry into the commercial refrigeration and air-conditioning field.

Our product line consists of hermetic compressors ranging in capacity from $\frac{1}{4}$ to $7\frac{1}{2}$ H.P. They're designed for low, medium, and high temperature applications, and we believe them to be unsurpassed for dependable performance.

Our manufacturing facilities are big, modern, well-staffed and well-tooled. They can handle any size order you give us.

Our personnel know the business and are dedicated to carry out our main policy . . . to provide you with the finest products and best service available. We want your business and will contact you soon to show you specifically what we have to offer.

NOT IN APPLIANCE BUSINESS

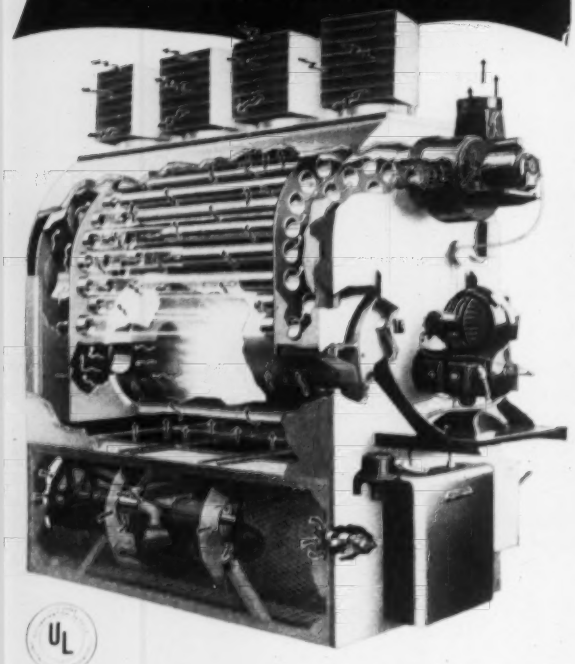
Our name may lead you to believe we also are in the appliance business. Neither this division nor the parent company in Elyria, Ohio, has any connection with appliance manufacturing. We make compressors and condensing units, nothing else. Bendix-Westinghouse is a joint subsidiary of Bendix Aviation Corporation, Detroit, Michigan, and Westinghouse Air Brake Company, Wilmerding, Pennsylvania.

Bendix-Westinghouse®

EVANSVILLE DIVISION *Evansville, Indiana*

A Division of Bendix-Westinghouse Automotive Air Brake Company, Elyria, Ohio

Commercial-Aire



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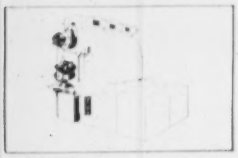
Space Heaters

300,000 BTU's

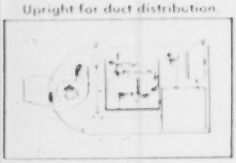
TO 2,000,000 BTU's

Provides industry with lowest cost heating. Primary cylindrical stainless steel combustion chamber, secondary heat-extracting tubes, consistent rate of combustion gas flow provide high efficiency, utilizing 80% of available heat of fuel. Highly adaptable to desired mounting arrangements. Features low first cost, easy maintenance, complete accessibility to all service points. Completely equipped and wired with controls for economical installation.



Series "FD"
Upright for duct distribution.

Series "HD"
Horizontally for duct distribution.



Series "H"
Horizontally suspended.

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Inverted suspended.

MAMMOTH FURNACE CO.
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Minneapolis, Minn.

Send full details, prices, delivery dates, etc., on Commercial-Aire Heaters.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

WHO'S WHAT

Continued

central district sales manager, will assume his new post on a loan basis and will headquarter in Washington, D.C.

▸ *PERFECTION INDUSTRIES DIV., HUPP CORP.*—Daniel N. Gredys, vice president in charge of engineering; H. A. Consor, vice president of manufacturing at company's Cleveland plant; John Gardner, vice president of manufacturing at Waynesboro, Ga.; Robert E. Dyas, manager of contract refrigeration sales.

▸ *AMERICAN GAS ASSOCIATION*—J. B. Balmer, a director. Mr. Balmer is president of John Wood Co.

▸ *WM. STEINEN MFG. CO.*—Robert W. Hundley, general manager of all products divisions; Chris Jensen, Jr., sales manager of heating products division.

▸ *SERVEL, INC.*—For "All-Year" air conditioning division: Robert K. Eskew, sales manager; John N. Davidson, chief engineer.

▸ *BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE CO.*—For Evansville Div.: Clyde E. Ploeger, director of engineering; A. G. Wirick, manager of manufacturing; Donald J. Wood, general sales manager; John W. Downen, service manager; W. J. Aulsebrook, manager of quality control; George W. Phillips, comptroller.

▸ *CRANE CO.*—William E. Konrad, merchandising manager of heating and air conditioning department.

▸ *BELL & GOSSETT CO.*—H. R. Henke, marketing manager; George U. Miller, advertising manager; Philip C. Kosch, manager, development builder department.

▸ *TRANE CO.*—Robert Yeomans, assistant secretary and secretary of the board of directors.

▸ *BRYANT MFG. CO.*—William M. Day, director of engineering.

▸ *BALDWIN-HILL CO.*—John L. Mohun, general manager of manufacturing.

▸ *PREFERRED UTILITIES MFG. CORP.*—J. S. Kaplan, president; G. W. Bohn, chairman of the board; W. H. Bohn, vice president.

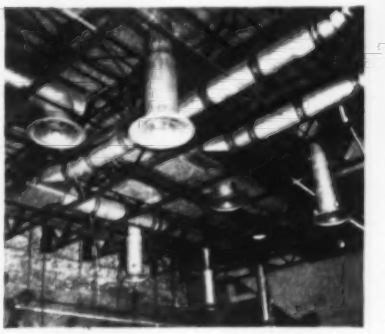
"FREON"* REFRIGERANTS IN AIR CONDITIONING

Field Reports About Successful Installations

Soundproofed ducts deliver cool air to speed movie making

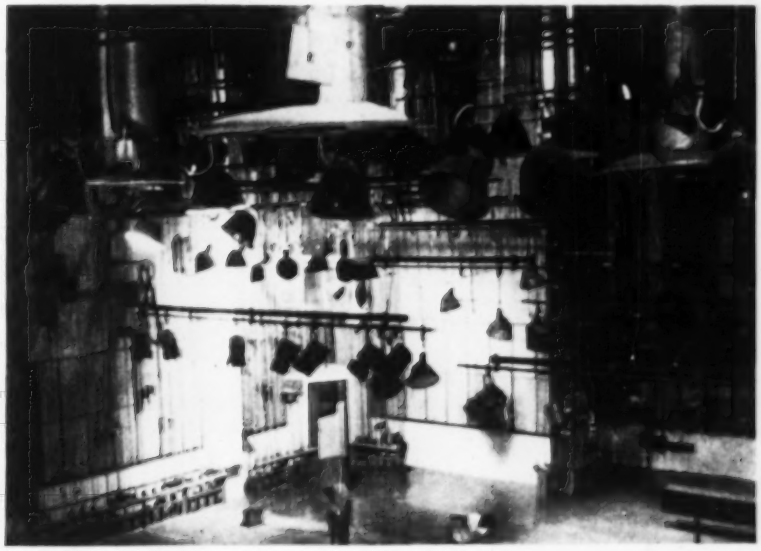
New York's old Ninth Regiment Armory now houses the most modern movie production center in the world. Uniqueness of the center—independent of cameras, sound equipment and lighting—is derived from its completely air conditioned studios.

One of the major problems overcome by Wolff & Munier, Air Conditioning Contractors, was soundless delivery of 20,000



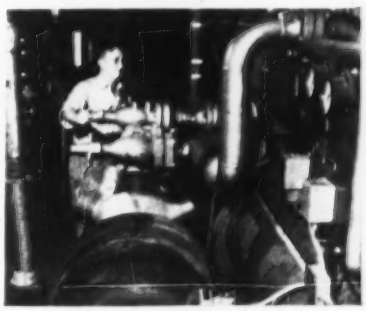
cfm of conditioned air to each of two filming areas. With conventional ductwork the sensitive microphones would amplify and transmit low-level fan rumble to the sound tapes. To absorb fan noise, all branch ducts, roof plenums and low-velocity delivery ducts have sound-absorbing glass-fiber linings 2" to 4" thick. During filming, eight ducts (of the type shown above), with Anemostat diffusers, spread cool air directly overhead—just clearing the batteries of arc lamps.

Soundless air conditioning cuts filming time ¼ to ¼ and may help revive New York as the nation's movie-production center.



Versatile system with zone control and telescoping ducts takes high heat load

Proximity to New York's acting and writing talent prompted Himan Brown, head of Production Center, New York City, to convert the old Ninth Regiment Armory for movie making. The building was completely rebuilt with air conditioning, a must to help keep operations going at top speed under the intense heat of lights.



Heart of the system is two 100-ton Carrier refrigerating units (like the one shown at left), which cool air for distribution to the studios. Each main studio (such as that pictured above) is divided into 4 quadrants with 8 diffusers per quadrant. On minimum load 2 diffusers deliver 1,250 cfm each. On maximum load all 8 operate to deliver 12,500 cfm. Distribution of air to the 4 quadrants is controlled from a panel in each studio. Here, air conditioning has proved its worth in speeding movie making.

You can specify a "FREON" refrigerant for any air conditioning or refrigeration application

Effectiveness of air conditioning for Production Center is due in part to the charge of "Freon-22" refrigerant in the cooling system. No component of the cooling system is more important than the refrigerant used. That's why you should always specify "Freon" for the jobs you do.

You can be sure "Freon" refrigerants will never give you any trouble from acids or moisture. "Freon" refrigerants are safe—nonflammable, nonexplosive, virtually nontoxic. Your wholesaler can promptly supply a "Freon" refrigerant for any size or type of air conditioning or refrigeration application.

For more information or technical data on uses of "Freon", write to E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Div. 712, Wilmington 98, Del.

Always ask for "FREON"

1931 KINETIC 1956

25 years of

FREON

SAFE REFRIGERANTS

**"Freon" is Du Pont's registered trademark for its fluorinated hydrocarbon refrigerants.*

DU PONT

BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

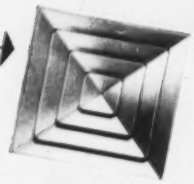
air patterns unlimited without blank-offs

AGITAIR® *Custom Made*

AIR DIFFUSERS with DIFFUSING VANES

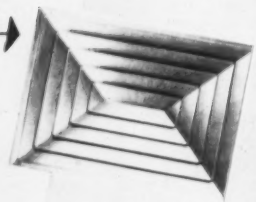
. . . better because

A good piece of equipment is no better than the experience behind it.



. . . better because

It's the original square and rectangular outlet . . . not just a poor imitation without distinctive features.



. . . better because

The company behind these diffusers has a history for doing things right and guaranteeing results.

you can depend on AGITAIR *for better air*

Your local AGITAIR representative will gladly assist you in selecting the proper size and air pattern to meet the requirements of your job. In addition, the engineering staff and laboratory resources of Air Devices Inc., are available to you.

AIR DEVICES INC.

185 MADISON AVENUE NEW YORK 16, N. Y.

Air Diffusers • Filters • Exhausters

WHO'S WHAT

Continued

▸ *AIRTEMP DIV., CHRYSLER CORP.*—Marvin B. Smith, assistant to vice president in charge of sales; H. M. Carnahan, manager of project sales; T. E. Muir, named to staff of air conditioning and heating sales manager.

▸ *YORK CORP.*—Bern Maseritz, sales manager, ice and refrigeration equipment.

▸ *JOSEPH T. RYERSON & SON, INC.*—George E. Handtmann, assistant to the president; James E. Dittus, director of quality; Rolla R. Ross, manager of systems and procedures; George G. Moody, office manager for general office; George H. Blank, assistant to the general office manager; Clive C. Earle, manager of alloy and stainless steel sales.

▸ *ORR & SEMBOWER, INC.*—Vincent N. DeCerchio, assistant to the president. His general duties will be in the handling of government work.

▸ *E. I. du PONT de NEMOURS AND CO.*—Appointed assistant general managers are: Dr. William C. Kay, organic chemicals department; Ernest R. Bridgwater, Elastomer chemicals department.

▸ *UNITED STATES AIR CONDITIONING CORP.*—James H. Flowers, advertising manager.

▸ *ARMSTRONG FURNACE CO.*—E. F. Daugherty, chairman of membership committee, American Society of Refrigerating Engineers.

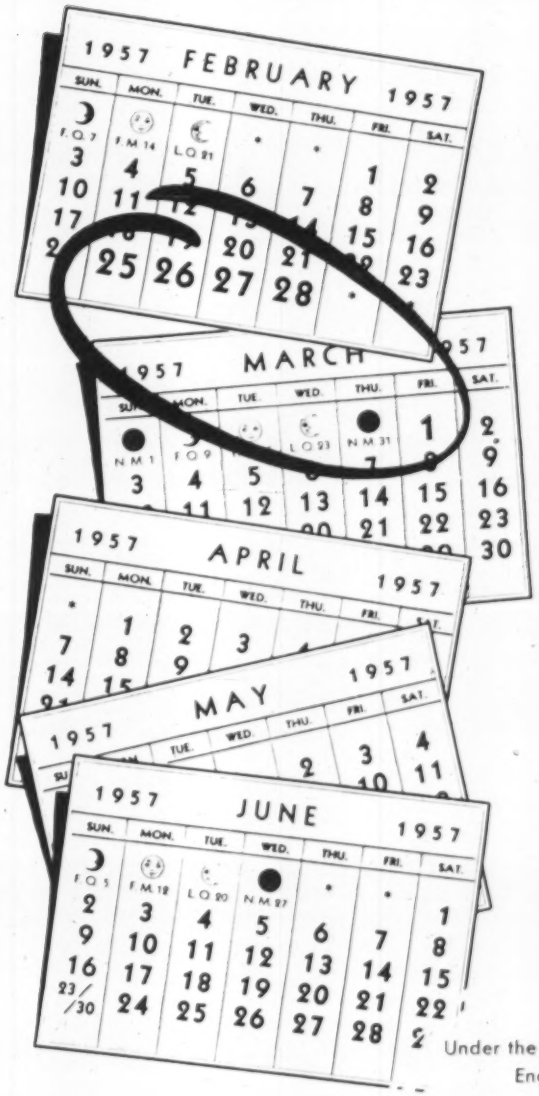
▸ *BORG-WARNER CORP.*—Stanley J. Roush, group vice president. Several divisions of the corporation will report directly to Mr. Roush.

▸ *AIRTEMP CONSTRUCTION CORP.*—Herbert G. Stephan, supervisor of execution engineers.

▸ *TUBE TURNS PLASTICS, INC.*—Milo Harrison Buzzee, to direct marketing of custom molded products and handle special assignments.

▸ *COPELAND REFRIGERATION CORP.*—James E. Barker, assistant sales manager.

▸ *ELECTRO DYNAMIC DIV., GENERAL DYNAMICS CORP.*—Bruce A. Guinter, plant engineer; Rodney F. Plimpton, administrative assistant to the general manager.



Spend 5 DAYS

AND SAVE 5 MONTHS —OR MORE!

at the 13th INTERNATIONAL HEATING & AIR-CONDITIONING EXPOSITION

(formerly the International Heating and Ventilating Exposition)

INTERNATIONAL AMPHITHEATRE—CHICAGO

February 25—March 1, 1957

Under the auspices of the American Society of Heating and Air-Conditioning Engineers, and in conjunction with their 63rd annual meeting.

More than four hundred and fifty manufacturers, exhibiting the latest developments in heating, ventilating and air conditioning will make your trip to Chicago more than worth-while. Five days at the world's largest exposition of its kind will bring you completely up-to-date with the great strides made in your branch of the industry—industrial, commercial or domestic. Save time and money—see first-hand thousands of new and improved products—ready to serve you. You'll get valuable information that otherwise might take months to accumulate. Plan *now* to be at the exposition and bring your associates with you. To *be sure*, write for advance registrations to:

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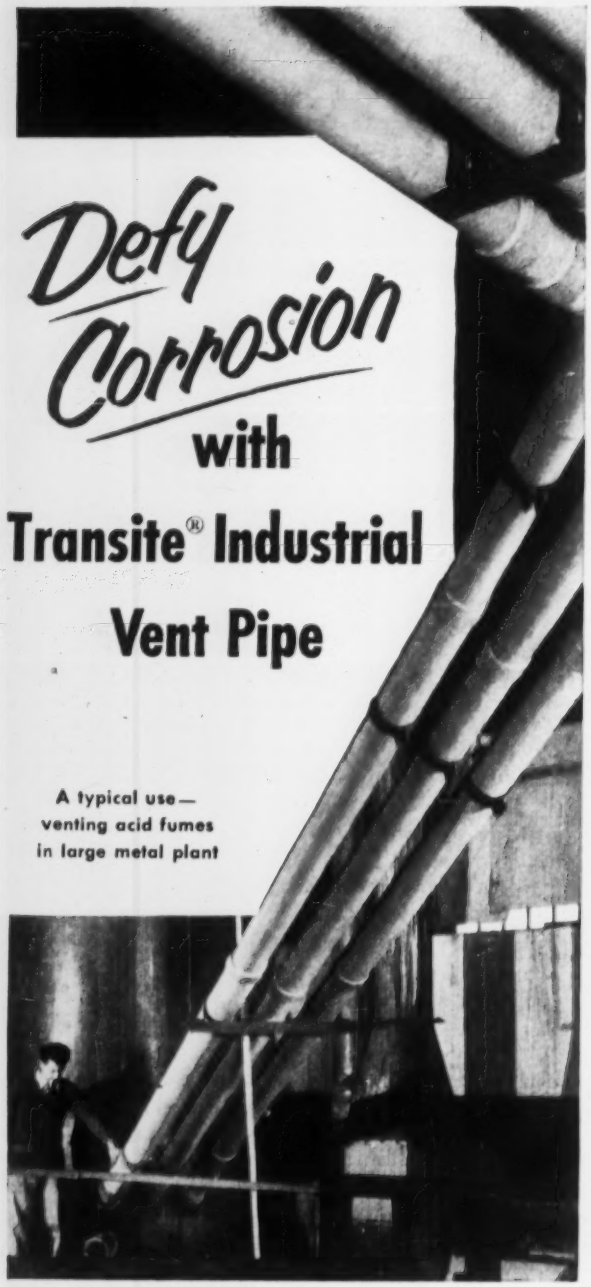
Management: International Exposition Co.



IN SEVERE VENTING SERVICES, Transite's outstanding performance is a matter of record. Made of asbestos and cement, two of nature's most indestructible materials, it resists the attack of most fumes, vapors, and dusts.

Installed indoors or out, Transite Industrial Vent Pipe can't rust or rot, never needs paint, nor other protective coating. Wide variety of fittings makes it adaptable to any layout. For more information, write Johns-Manville, Box 14, New York 16, N.Y. In Canada, Port Credit, Ontario.

Johns-Manville
TRANSITE INDUSTRIAL VENT PIPE
An Asbestos-Cement Product

WHO'S WHAT — *Continued*

▸ *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—Edwin B. Olson, manager of market planning.

▸ *HOWELL ELECTRIC MOTORS CO.*—T. A. Armstrong, assistant sales manager; H. D. Lewis, manager of industrial sales; Francis L. Sherman, associated with federal and marine sales department.

▸ *TRANE CO.*—Edwin C. Phillips, to be executive vice president and general manager of Trane Co. of Canada, Ltd. Mr. Phillips will succeed Grant E. Cole, retiring January 1.

▸ *MODINE MFG. CO.*—M. J. Druse, given additional assignment of market research manager. Mr. Druse is director of advertising and public relations for Modine.

▸ *BRUNNER MFG. CO.*—Wallace J. Hoeing, sales manager.

▸ *STANFORD RESEARCH INSTITUTE*—E. Finley Carter, director and member of the board of directors.

▸ *BLACKMER PUMP CO.*—Elmer H. Lanthorn, vice president and director of sales; Virgil A. Brunson, vice president and chief engineer.

▸ *INGERSOLL CONDITIONED AIR DIV., BORG-WARNER CORP.*—William T. Goldsmith, general sales manager.

▸ *IRON FIREMAN MFG. CO.*—D. Paul Bailey, marketing manager.

▸ *H. K. PORTER CO., INC.*—Sam Gurley, Jr., vice president-sales.

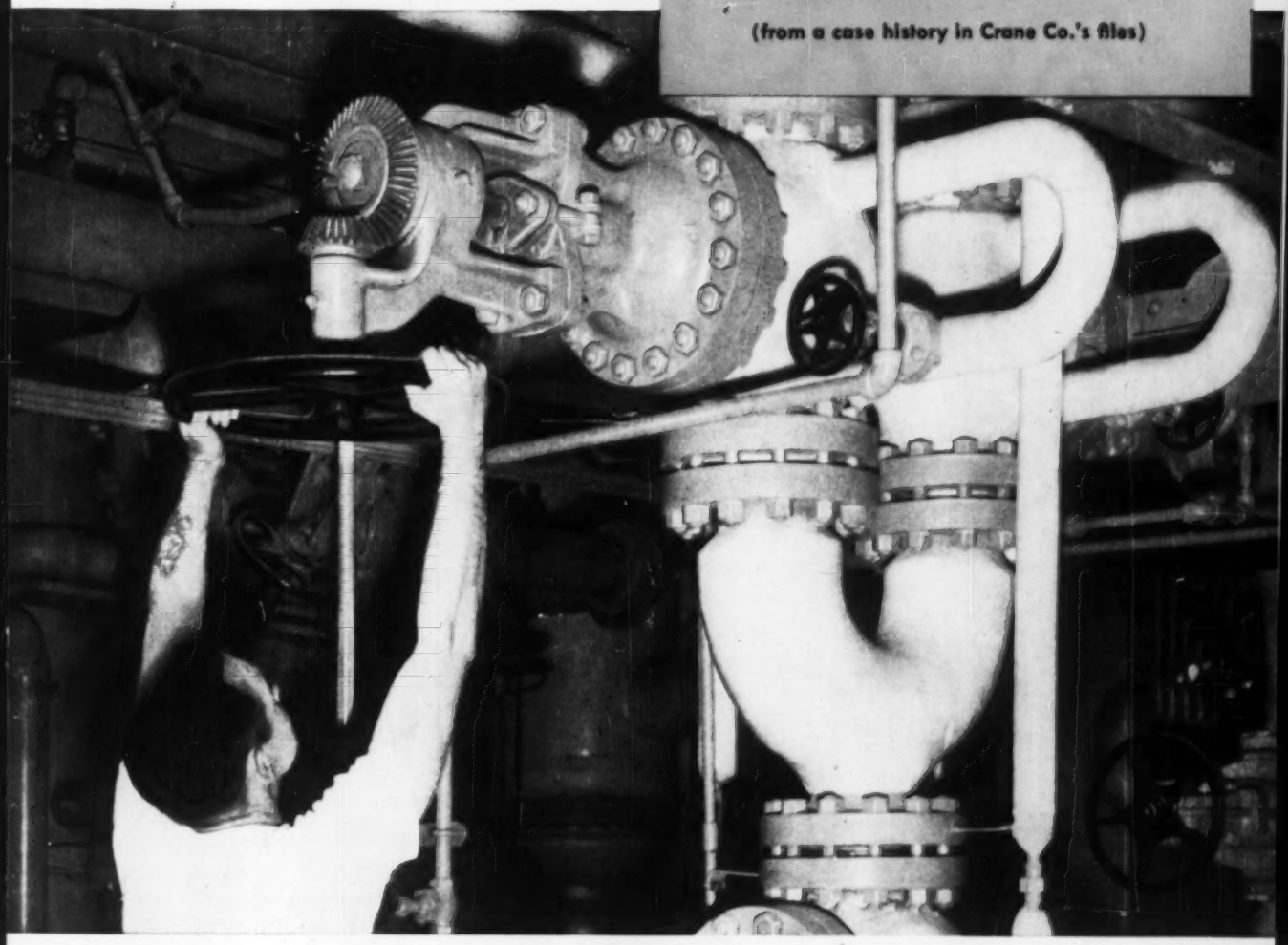
▸ *ALLOY STEEL PRODUCTS CO., INC.*—Harold C. Templeton, chief metallurgist.

▸ *ALLIS-CHALMERS MFG. CO.*—J. F. Costigan, assistant director of manufacturing of company's industries group.

▸ *MITCHELL MFG. CO.*—George Livermore, administrative assistant to the general manager; Conrad Bouchard, general purchasing agent.

INTERESTING FACTS ON VALVE PERFORMANCE

(from a case history in Crane Co.'s files)



14-year proof of low-cost valve performance on feed water

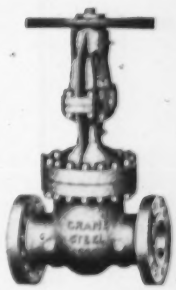
How does a modern utility hold down valve costs?

Central Power & Light Co., Corpus Christi, Texas, has proof of one way to do it: through the rugged dependability of Crane valves like the one shown above.

Fourteen years ago, Central Power installed this Crane No. 76XR valve on the feedwater pump discharge line at its Nueces Bay Station in Corpus Christi, Texas. The valve is a 6-inch gear-operated gate type. Consider its record: since 1942, this Crane valve has been handling feed water at 600 psi., 400° F. Maintenance? *None whatsoever*—the valve hasn't leaked once in 14 years, and is closing as tightly and smoothly as the day it went on the line.

In selecting your all-important valves, don't be misled by outside appearances. What counts in valve performance are *inside*—precision machining, superior materials, expert assembly and testing. That's why Crane valves are preferred throughout industry—and why Crane has been a leading valve manufacturer for over a century.

For full information on the big, complete Crane line, contact your local Crane Representative or write to address below.



CRANE **VALVES & FITTINGS**

PIPE • KITCHENS • PLUMBING • HEATING

More Facts on Steel Gate Valves—See Over

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

Better qualified for power services because of better inside quality

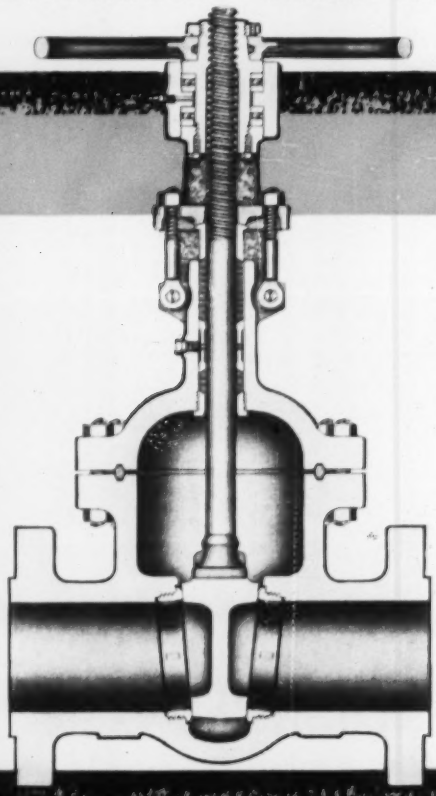
CRANE STEEL GATE VALVES

Performance like that demonstrated on the preceding page comes only from superior inside quality. In Crane steel valves, this quality is guarded with unusual skills and facilities.

In design, Crane draws on a hundred-year background in valve engineering. In the foundry, Crane works with the know-how of a pioneer and developer of steel valve casting techniques. In machining, assembling and testing, Crane's standards are unexcelled.

The 600-Pound pattern shown below speaks for the complete Crane steel gate family. In each feature there's greater assurance of dependable flow control at low cost.

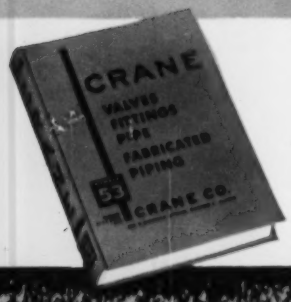
For steam, water, air, and general services, Crane recommends these valves with Exelloy to No. 49 nickel alloy seating. For oil and oil vapor, Exelloy to Exelloy seating is recommended. Also available with Stellite trim.



1. Note rugged proportions of stem; yet, Crane gives it added strength with heat-treating. Threads are precision-cut, long, generously engaged with yoke sleeve.
2. Two-piece ball-type gland and gland flange unit maintains uniform loading on packing and prevents binding on stem, even if bolts are pulled up unevenly.
3. Swing-out eye bolts on the packing gland flange simplify repacking.
4. T-head disc-stem connection prevents lateral strains on stem; gives lasting, smooth operation.
5. Full-length, close-fitting disc guides maintain accurate seating and reduce wear on seating surfaces.
6. Handwheel is strong, malleable iron—rigidly mounted. Designed for firm, comfortable grip.
7. Deep stuffing box with high grade packing assures tight stem seal, long packing life.
8. Note the strong body, bonnet, and end flanges. All valves 400-pound and over have ring-type bonnet joint. All bonnets have stem-hole bushing.
9. Body seat rings are replaceable should that be needed.
10. Heavy section body has added reinforcement at points of stress. Ports are straight-through, minimizing flow resistance, turbulence, and erosive action.

600-pound Crane steel gate pattern (cross section)

Crane cast steel gate valves are regularly supplied in 150-, 300-, 400-, 600-, 900-, 1500- and 2500-pound pressure classes. Sizes up to 24 in. Screwed, flanged or welding ends. Companion lines of globe, angle and check valves also regularly available.



Your complete guide to valve selection—steel, alloy, iron or bronze

There's no better place than your Crane Catalog to find the valves and fittings best suited to your piping requirements. It gives you the world's largest selection, complete with service recommendations and all specification data in handy, easy-to-use form. When you're ready, there's a local Crane Representative in your area on call to work with you.

WHO'S WHAT

Continued

▶ *MIDWEST RESEARCH INSTITUTE*—Dr. Stefan H. Robock, manager of industrial economics division.

▶ *BLACK & DECKER MFG. CO.*—Robert Appleby, managing director of company's subsidiary in England.

▶ *ROBERTSHAW-FULTON CONTROLS CO.*—A. A. Hansen, national service director.

▶ *JOHN WOOD CO.*—B. G. Bowden, director of styling and industrial design.

▶ *RUBEROID CO.*—John Kenneth Stewart, general superintendent of company's gypsum mine and plant at Wheatland, N. Y.

▶ *W-S FITTINGS DIV., H. K. PORTER CO., INC.*—William Rainey, manager of new product development.

▶ *HUPP CORP.*—Rear Adm. Paul E. Pihl, chairman of the board, Hupp Aviation Co., a subsidiary.

▶ *WALWORTH CO.*—Howard A. Reid, executive assistant to vice president in charge of sales.

▶ *HOOKER ELECTROCHEMICAL CO.*—E. Paul Duncan, supervisor, technical service, at Tacoma, Wash.

▶ *REDMOND CO., INC.*—Gerald Forrest, sales engineer in charge of special products sales division.

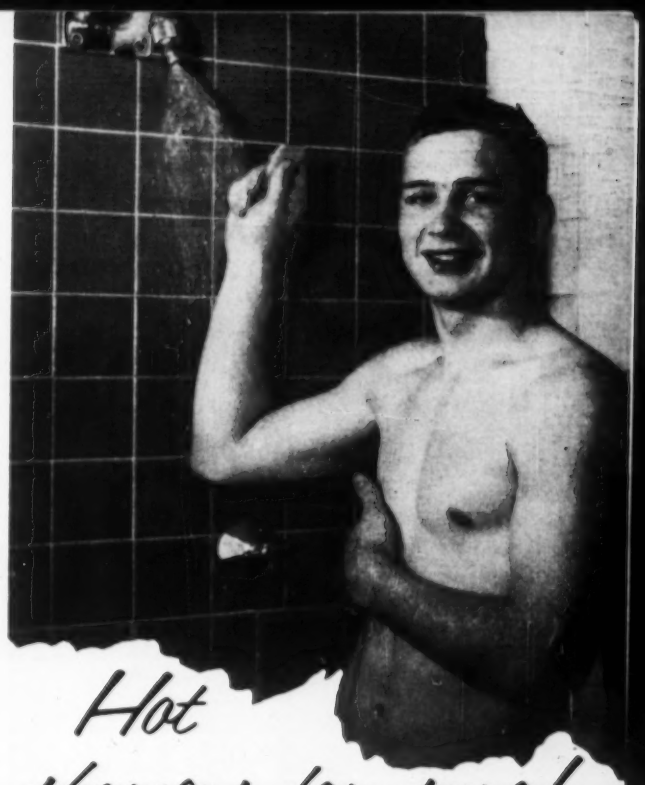
▶ *MAGNETROL, INC.*—B. L. Binford, vice president in charge of manufacturing.

▶ *WEBSTER ELECTRIC CO.*—Roy Lewane, assistant advertising manager.

▶ *ANSUL CHEMICAL CO.*—L. Thomas Plouff, export sales manager.

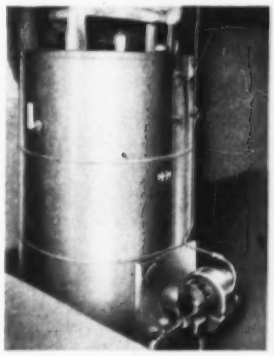
▶ *WHITE-RODGERS CO.*—Howard A. Teasley, national sales application engineer.

▶ *THERMO-FLEX CORP.*—Norman G. Plass, assistant treasurer.



Hot showers for sure!

at school gym—thanks to a MT. HAWLEY WATER HEATER



THE PROBLEM was how to supply plenty of hot water for showers at this high school gymnasium, DePue, Ill., during mild weather without firing up the large boiler used for heating. Because of its high efficiency, this water heater is used throughout the year.

THE SOLUTION was this Mt. Hawley AG-300 direct-fired, galvanized water-heater. Little floor space was required for this oil-fired unit—yet it has a recovery rate of 1200 gph at 100° F. rise from 40° to 140° and a storage capacity of 265 gal.

For a wide range of commercial hot water needs the Mt. Hawley AG Series water heaters are the perfect answer. They're compact, efficient—ready to provide low-cost hot water for hospitals, schools, laundries, service stations, restaurants, small industrial plants, motels and other buildings.

HEATING REQUIREMENTS for the gym were also solved by Mt. Hawley—an electronic G-8 Burner (15 gph) installed in a steel boiler. The Mt. Hawley G-8—highly popular light oil, high pressure, gun-type burner—was completely equipped with electronic controls and delayed-action fuel supply. *There's a Mt. Hawley burner for every heating job.*

Today—write, wire or phone Peoria 2-5448 collect for free literature and prices—at no obligation.

MT. HAWLEY MFG. CO.

Dept H-12 ● Routes 174 & 88 Peoria, Illinois

400 TONS CAPACITY

PATENTED DUO-PASS and OILOUT

Aeropass CONDENSER

U.S. Patent Reissue No. 21,917; 22,551

YOU USE LESS POWER...
SAVE CONDENSER WATER...
SAVE UPKEEP COST

For large refrigeration systems, NIAGARA gives you a choice between a battery of condensers (that may be cut on or off with the load) or a high capacity condenser that saves space.

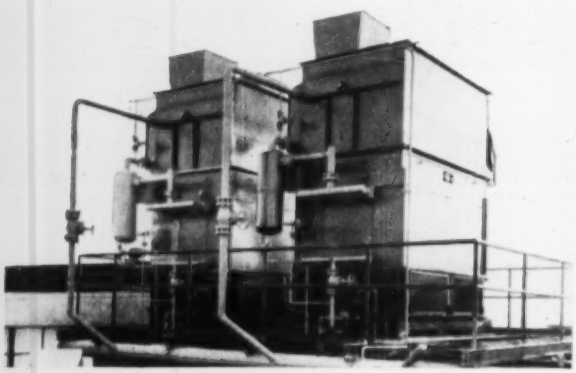
Both have the patented "Duo-Pass" and "Oilout" that remove superheat and keep the system free of oil. Results: you save one-third or more of power cost and upkeep expense. Niagara Patented Balanced Wet Bulb Control gives lowest head pressure operation automatically. *Write for Bulletin 111.*

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. HP, 405 Lexington Ave. New York 17, N. Y.

Field Engineers in Principal Cities of U. S. and Canada



WHO'S WHAT — *Continued*

▸ *BITUMINOUS COAL RESEARCH, INC.*—Robert D. Saltsman, project engineer assigned to Columbus, Ohio, laboratory.

▸ *BORG-WARNER CORP.*—Roy C. Hauck, manager of Primor Products Div.

▸ *WELDING FITTINGS CORP.*—Edward H. Leimbacher, assistant to president.

▸ *AIR REDUCTION CO., INC.*—David H. Lyall, treasurer.

IN THE TERRITORIES . . .

(Recent sales appointments)

▸ *MODINE MFG. CO.*—New sales representatives and their territories are: William D. Burk, Alaska, Yukon territory; Gene Arledge Co., Inc., Jackson, Miss.; J. C. Kelly Co., Spokane; R. E. Newlin and Assoc., New Orleans; L. R. Gorrell, Raleigh.

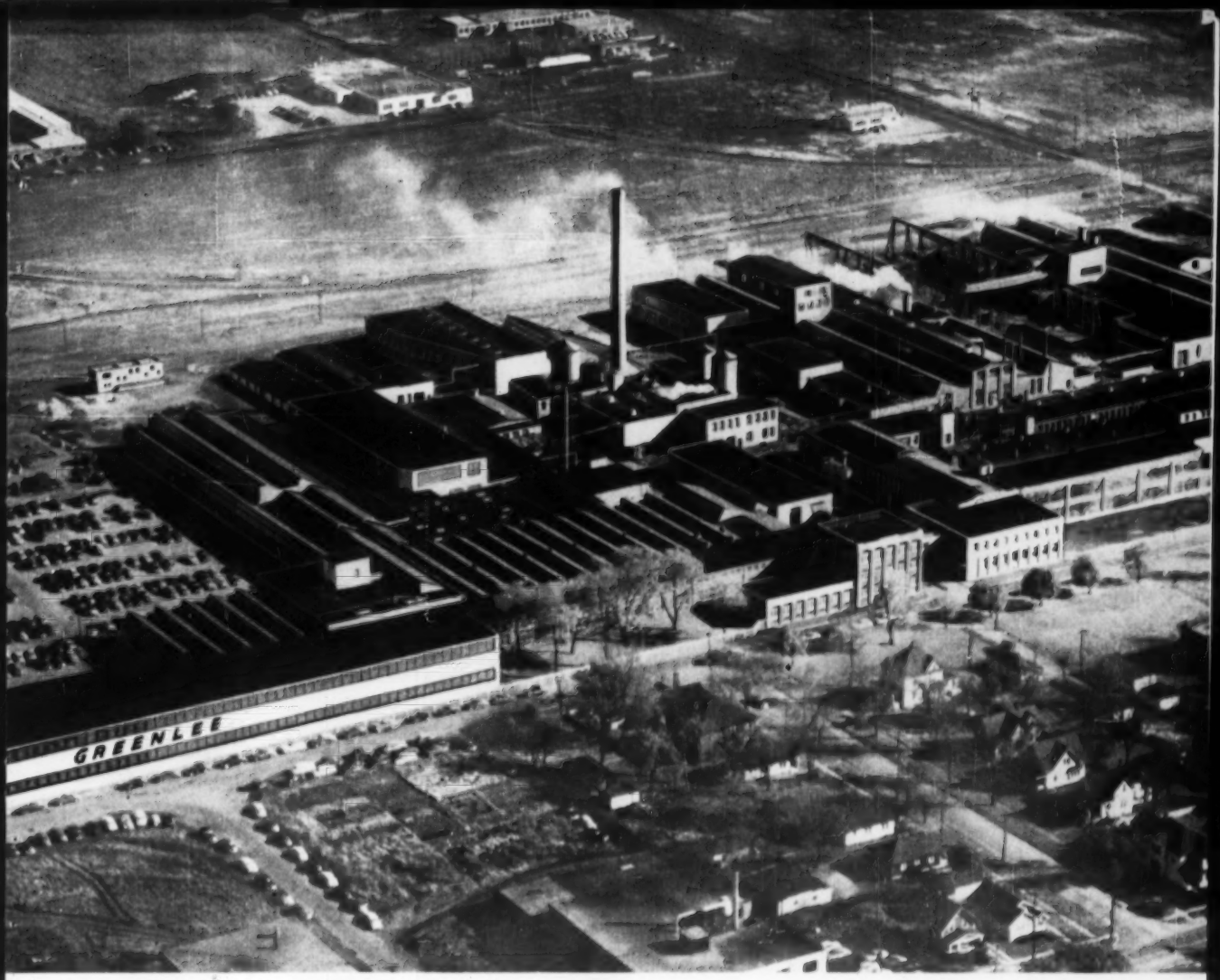
▸ *JOHNSON SERVICE CO.*—Sales engineer transfers are: E. Lyle Davis, from Albuquerque to Los Angeles; Arthur F. Worden, Jr., from Milwaukee to Buffalo.

▸ *ALLIS-CHALMERS MFG. CO.*—O. V. Tally, manager of Washington district; G. E. Conn and M. G. Jones, managers of Buffalo and York (Pa.) district offices, respectively, for company's industries group; Charles F. O'Riordan, manager of midwest region, industries group.

▸ *YORK CORP.*—New distributors for room air conditioners are: Harry Knodel Distributing Co., Ohio, Kentucky, Indiana; Southern New England Distributing Corp., northern Connecticut, western Massachusetts; C. B. Stone, Inc., New London, New Haven and Middlesex Counties, Connecticut; Electra Merchandising Distributors, Inc., Albany, N. Y. Howard E. Davis, Jr. has been appointed vice president and general manager of Air Conditioning Wholesalers, Inc., York's Boston distributor.

▸ *PENNSYLVANIA SALT MFG. CO.*—Merle W. Semisch, southern district manager of "Isotron" refrigerants sales.

▸ *L.O.F GLASS FIBERS CO.*—John M. Vanselow, field sales representative in Philadelphia area.



Greenlee cuts steam costs 18%-20% burning coal the modern way

Consult an engineering firm

Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

Expanding facilities at Greenlee Bros. & Company, Rockford, Illinois, created a problem common to many growing firms. The Company's three old boilers had to operate continually at maximum capacity, so that a forced outage could hurt plant production. In addition, peak load operation with outmoded equipment resulted in high fuel costs.

While the newest boiler was retained, Greenlee replaced the other two with modern high-capacity units, including stokers, up-to-date controls and other equipment for more efficient operation. A new, pneumatic ash handling system was installed. Today Greenlee is getting 10%-20% more steam for each pound of coal burned and steam costs are down 18%-20%, saving Greenlee thousands of dollars every year.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

BITUMINOUS COAL INSTITUTE

Southern Building • Washington 5, D. C.

GET THE
Plus
IN HEATER EFFICIENCY
WITH AN OLSON

- Reverse Current Gas Travel
- Extra Heat Transfer Surface
- Completely Automatic
- Smooth, quiet operation

WRITE FOR FREE BOOKLET

Olson Heaters are available for industrial and commercial buildings as well as a number of special adaptions. Capacities are from 300,000 to 2,000,000 BTU output.

STAINLESS STEEL combustion chamber. Floating design eliminates expansion and contraction stresses. Secondary heat transfer is provided with a multiple battery of 10 gauge boiler tubes. The extended flue gas travel and extensive heat transfer surface insures safe metal surfaces and long heater life.

Olson

STAINLESS STEEL DIRECT FIRED HEATERS

ARTHUR A. OLSON & COMPANY · Canfield, Ohio

REPRESENTATIVES IN PRINCIPAL CITIES

WHO'S WHAT

Continued

▸ *VILTER MFG. CO.*—Walter H. Harvey, sales representative working out of firm's Cincinnati office.

▸ *GENERAL CONTROLS CO.*—Morris P. Stillinger, sales engineer, Los Angeles territory. The company's Seattle district office and warehouse have been moved to new and larger quarters at 925 Westlake Ave., N. William R. Nason is in charge.

▸ *AIRTEMP DIV., CHRYSLER CORP.*—F. J. Laughna, R. E. Davis and R. T. Marshall, managers of factory owned distributorships in New York City, Kansas City and Houston, respectively; G. S. Cobb, staff assistant to vice president in charge of sales, to direct Dallas area distributor-dealer development program; R. H. Friedel, also a staff assistant, to be in charge of merchandising development, west coast region; F. G. Hill, Dallas regional manager; E. D. Dickson, west coast regional manager; E. O. Butler, St. Louis regional manager; J. N. Tuttle, assistant manager of New York distributorship; J. V. Browne, Detroit assistant regional manager; H. L. Kerr, New York assistant regional manager; G. H. Gay and G. H. Stephan, field engineers, Dallas territory; T. G. Hendricks, Dallas district manager.

▸ *W-S FITTINGS DIV., H. K. PORTER CO., INC.*—James M. Tough, manager of new Atlanta office, which will serve Florida, Georgia, Mississippi, Alabama, the Carolinas, Tennessee.

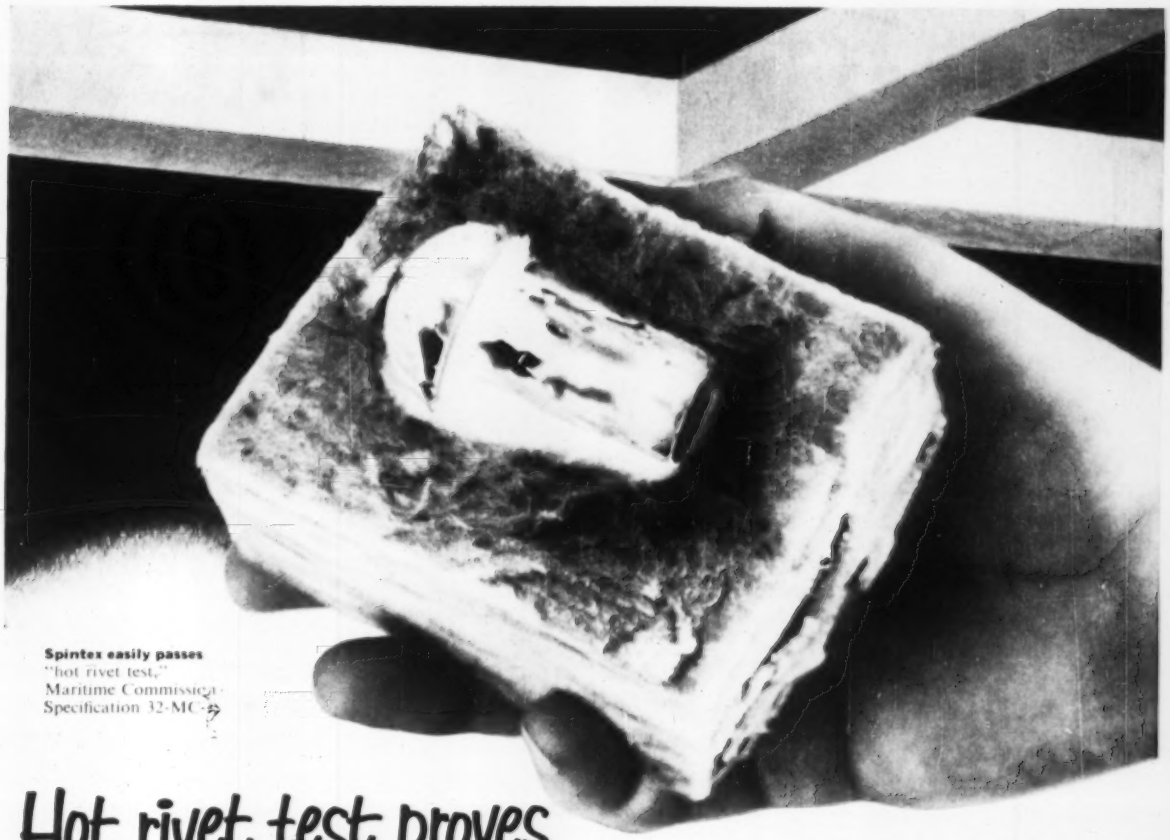
▸ *L. J. WING MFG. CO.*—William H. Rose, added to staff of United Boiler and Engineering Co., Wing's Erie, Pa., representative.

▸ *NATIONAL-U.S. RADIATOR CORP.*—T. J. Williams, assigned to Pittsburgh branch sales staff to represent company's heating and air conditioning division in area surrounding Bedford and Altoona, Pa., Cumberland, Md.

▸ *PACKLESS METAL HOSE, INC.*—E. S. Johnson, representative covering northern midwest area.

▸ *AMERICAN RADIATOR & STANDARD SANITARY CORP.*—Warren Tauber, district representative for northern New Jersey territory for air conditioning division.

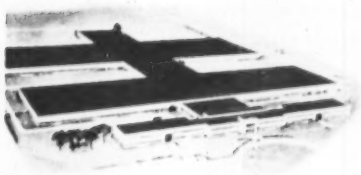
▸ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—W. G. Cline Co., Wolverine's western agent, has opened new offices and mill depot facilities in Denver.



Spintex easily passes "hot rivet test," Maritime Commission Specification 32-MC-?

Hot rivet test proves

J-M Spintex duct insulation offers unsurpassed fire safety!



IBM uses Spintex for 205,000 sq. ft. of duct! New 781,000-sq. ft. IBM plant, Kingston, N. Y., is fully temperature-conditioned for more efficient production of electric typewriters and electronic computers.

Architects: Giffels and Vallet, Inc., L. Rossetti Assoc., Detroit, Michigan.

Spintex offers the fire-stopping advantages duct insulation must have! It will neither burn nor smoulder, and fire simply will not travel along a Spintex insulated duct.

Produced by a new Johns-Manville spinning process—new Spintex® is greatly improved. Its mineral fibres are measurably smaller in diameter and substantially more uniform. This improved fibrous structure adds countless heat-stopping dead-air spaces to every cubic inch . . . helps you maintain comfortable working temperatures at lower operating cost than ever before.

Spintex installs quickly . . . easily!

Spintex is clean, sanitary and "friendly" to handle and work with. It cuts readily with an ordinary knife. And it is easily and quickly installed even where ducts are curved or in difficult-to-reach places.

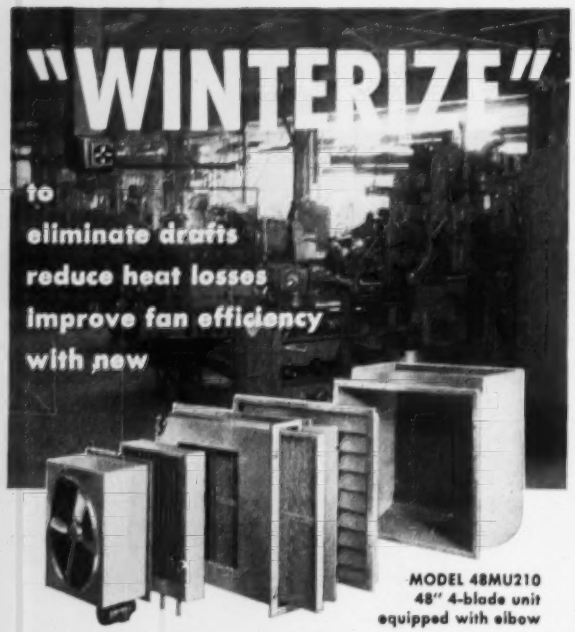
Spintex improves duct appearance in plant or office

Air conditioning ducts insulated with Spintex are neat and attractive, with trim, tidy joints. To meet unusual conditions or decorative needs Spintex is regularly furnished in a variety of special surfacings.

For more information and samples, contact your nearby Johns-Manville sales office. Or write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

Johns-Manville *first-in* INSULATION

MATERIALS · ENGINEERING · APPLICATION

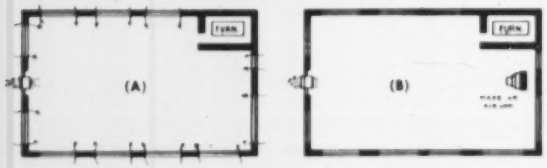


MODEL 48MU210
48" 4-blade unit
equipped with elbow

Aerovent INDUSTRIAL MAKE-UP AIR UNITS

Performance of fans and ventilating equipment installed to exhaust from production and processing areas depends *entirely* upon the availability of ENOUGH AIR! Without sufficient quantities to replace air exhausted, the air-handling system is soon "starved," creating a negative pressure or "vacuum" condition which is responsible for infiltration of outside air around doors and windows. The effect of the resulting draft places an additional work load on the plant heating system, with an ultimate decline in temperatures throughout the working area.

Here's a typical "MU" installation:



Warm air, exhausted from a machine shop area, replaced by cold air pulled through cracks and door openings (A). Filtered and tempered air, supplied by Make-Up Air Unit installed in same area (B) helps to maintain constant temperatures; levels-off "peaks" and "valleys" in boiler or furnace loading.

New Aerovent Industrial "Make-Up" Air Units, designed to supply ample quantities of clean, pre-heated air, aid in maintaining peak fan performance, reducing drafts and in stabilizing uniform heating loads. Available in seven unit arrangements in sizes 24" to 54" for capacities to 33,000 CFM. Write for free Bulletin 850.

All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51

Aerovent FANS *Aerovent* FAN COMPANY, INC.
Ash and Branch Sts. • Piqua, Ohio

WHO'S WHAT

Continued

▸ *DRAVO CORP.*—Charles R. Cox, assistant manager of Pittsburgh district office for machinery sales department.

▸ *CONOFLOW CORP.*—Lewis M. Crowe Co., exclusive sales agent for Georgia, eastern Tennessee.

▸ *ROBERTSHAW-FULTON CONTROLS CO.*—Continental Laboratories, Inc., representative for Montana, northern Idaho, northern Wyoming.

▸ *SERVEL, INC.*—Air Comfort Engineering Co., Inc., distributor of air conditioning in Meridian, Miss., trading area, including six counties in Mississippi, two counties in Alabama.

▸ *BRYANT INDUSTRIAL PRODUCTS CORP.*—John M. Shank Co., regional sales representative for Minnesota, the Dakotas, western Wisconsin.

▸ *PARKER APPLIANCE CO.*—Standard Brass & Mfg. Co., distributor for New Orleans. Haskel Engineering & Supply Co., a Parker distributor, has moved to 225 11th St., San Francisco, to obtain larger office and warehouse facilities.

▸ *WARNER ELECTRIC BRAKE & CLUTCH CO.*—Edward C. Evans, field sales representative to operate out of company's New York office.

▸ *TYPHOON AIR CONDITIONING CO.*—Leon J. Alyanakian, district manager for eastern Pennsylvania, Delaware, Maryland, Virginia, District of Columbia.

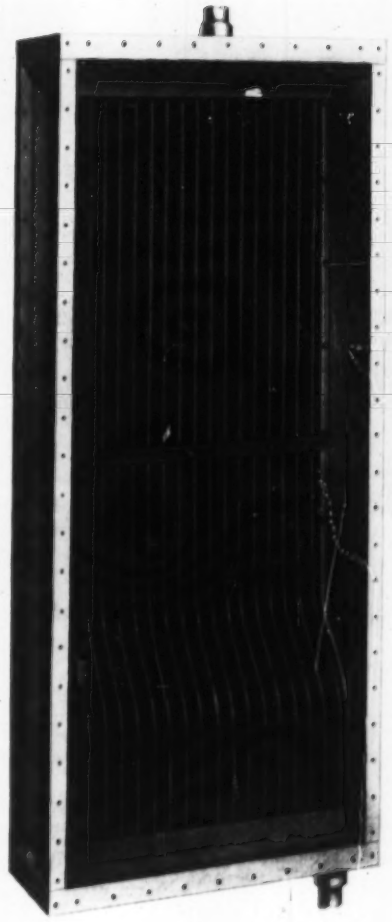
▸ *BALTIMORE AIRCOIL CO., INC.*—R. E. Newlin and Assoc., representative for Mississippi, southern Louisiana.

▸ *WHIRLPOOL-SEEGER CORP.*—Appointed regional sales managers are: Joseph E. Conroy, Boston; Harper R. Dowell, New York; Robert Lewis, Cleveland; Austin Schullstrom, Atlanta; Bernard Collins, Dallas; John Fellman, Chicago; Riley N. Stone, Kansas City; Peter Prussing, Hollywood.

▸ *TORK TIME CONTROLS, INC.*—Fred C. Baldridge, representative for Louisiana, Mississippi, western Tennessee, southern Alabama.

▸ *MARCO INDUSTRIES, INC.*—Allied Components, Inc., representative for Texas, Oklahoma.

EFFICIENT *Extended-Surface* HEAT EXCHANGERS



for

Heating
Cooling
Process
Air Conditioning

ASK THE AEROFIN MAN

Your Aerofin man's recommendation means high efficiency, long service life, low maintenance costs.

Aerofin's unequalled laboratory and manufacturing facilities — unequalled knowledge of heat-exchange practice — are devoted exclusively to the design and manufacture of highest quality extended heat surface.

Aerofin is sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 1, New York

WEBSTER

Research

Engineering

Design

Manufacturing

Sales

Service

- - - All are available through Webster's Service and Sales organization. Offices are located throughout the country.

It has always been the policy of Webster to make personal contact on every job — a Webster Combustion Installation must be satisfactory.

The engineering service departments of Webster and its exclusive agents would welcome the opportunity to help solve your combustion problems, to make recommendations and quotations.

Webster equipment is marketed through @JANITROL district offices and many other exclusive agents.

The
WEBSTER ENGINEERING *Company*
TULSA 1, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

WE HEAR THAT . . .

▸ *NATIONAL UNION ELECTRIC CORP.* has agreed to buy the assets of *ARMSTRONG FURNACE CO.* National Union has acquired Armstrong's name and business in an all-cash transaction. Both the products and present operating management of Armstrong will be retained. *W. J. OLSEN*, who served as president and director, is now a vice president and director of National Union and the general manager of *ARMSTRONG FURNACE CO., DIV. OF NATIONAL UNION ELECTRIC CORP.*, the name under which the company will now conduct business.

▸ For the purpose of obtaining greater market penetration for the company's air conditioning and heating products in three important trading areas, *AIRTEMP DIV., CHRYSLER CORP.* will open factory owned distributorships in New York City, Kansas City and Houston. Earlier this year Airtemp established its first company operated wholesale outlet in New Orleans. *H & C SUPPLY CO., INC.*, Akron area distributor for Airtemp, has broken ground for the construction of a 7000 sq ft warehouse addition. The facility will connect directly with the firm's present 12,000 sq ft structure in Akron. Completion is scheduled for February.

▸ Three more companies have been added to the growing membership of the *AIR MOVING AND CONDITIONING ASSOCIATION*. Elected to membership at the association's annual meeting were *MODINE MFG. CO., TRANE CO.* and *L. J. WING MFG. CO.* Representing their respective companies are *W. R. McMAHON*, Modine; *R. G. LUBINSKY*, Trane; and *T. R. PEYREK*, Wing.

▸ *ALBERT PENN*, chairman of the board of *PENN CONTROLS, INC.*, was a special guest at the I-Men's Banquet, University of Illinois, held recently in connection with the 50th anniversary of the university's first basketball team. Mr. Penn, who graduated in electrical engineering in 1909, was a member of that team. Prior to the banquet, Mr. Penn took part in a radio broadcast and appeared on television.

▸ A new $500,000 manufacturing facility will be constructed in Wabash, Ind., by *MINNEAPOLIS-HONEYWELL REGULATOR CO.* The 58,000 sq ft. one-story building will be used for the production of electronic air cleaning equipment and other specialized metal products for temperature control systems.

▸ Beginning in November 1881 with the formation of a small company to manufacture "double discharge fans" to exhaust wood shavings and sawdust in lum-

GILSULATE® helps another modern school hold costs to $10,000 per classroom

All underground steam lines protected with GILSULATE Insulation System

MODERN WILDER SCHOOL features 6-foot overhang on east and west as weather protection, 5-foot wide walks; each classroom has outside entrance. Exterior is brick veneer and concrete.

Mechanical Contractor: Intermountain Company, Boise, Idaho
General Contractor: L. H. Krieger Construction Company, Nampa, Idaho
Engineer: Kendall M. Wood, Spokane, Washington

"...this type of installation helped keep our costs down."

Harold G. Thompson, Architect, Boise, Idaho.

900-SQ. FT. CLASSROOMS feature plastic skylights and 12-500 watt concentric ring fixtures; continuous wall heating and a mechanical ventilation system. Total building area is 12,416 sq. ft.

Surveys show that most modern classroom construction costs average well over $30,000 per classroom. Yet the Wilder Elementary School in Wilder, Idaho, containing 11 classrooms, an administrative suite, plus separate boiler house, cost only $116,827! GILSULATE insulation was used on all the underground steam supply lines between the central boiler plant and other buildings. This remarkable cost level was also achieved at the Cadott School in Wisconsin—another GILSULATE installation.

The Wilder School installation consists of a 5-inch steam line and a 1¼-inch condensate return running for 156 feet from the boiler house to the school, and a 6-inch line and 1½-inch condensate running for 120 feet between the boiler and high school. The entire job required 17 tons of Type A GILSULATE, and took 21 man hours to install, plus 2 hours for a grader to backfill the trench.

Whatever type of job you have in mind—airport, school, utility, institution, factory, railroad—it will pay you to investigate the unusual features of this easily-installed, dependable, low-cost insulation system. Write for further information or see your local GILSULATE dealer.

FACTS ABOUT GILSULATE

1. **EASY TO USE**—just pour and tamp... pipe heat does the rest.
2. **FORMS 3 ZONES** of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. **NEEDS NO HOUSING OR MECHANICAL SHEATHS**: no mixing, special handling or equipment.
4. **ONLY NEEDS NORMAL PIPE SPACING**: for multiple pipe or cramped conditions.
5. **THREE TYPES AVAILABLE**:
   Type A for 220°-300° F. temp. range
   Type B for 300°-385° F. temp. range
   Type C for 385°-520° F. temp. range

THE TRIPLE-ZONE INSULATION SYSTEM FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California
OFFICES AT: 134-B West Broadway, Salt Lake City, Utah
1145 East Jersey Street, Elizabeth 4, New Jersey
The Agents Building, 3537 Lee Road, Cleveland 20, O.

It's the . . . Sterlco®

THERMOTROL

for ACCURATE, INDEPENDENT ROOM TEMPERATURE CONTROL

STEAM or HOT WATER SYSTEMS

. . . for modernization or new construction

CAN BE KEY LOCKED

for . . .

HOSPITALS, APARTMENTS, OFFICES, HOTELS, SCHOOLS, MOTELS, INSTITUTIONS and PUBLIC BUILDINGS

- **COMPLETELY SELF-CONTAINED**

  Each Sterlco Thermotrol is a complete temperature control unit, easily installed in any two-pipe system in place of the manual valve. NO wiring or other external connections needed.

- **MODULATING CONTROL—NOT on AND off**

  Each Sterlco Thermotrol provides steady, even control to each radiator the way YOU want it. Radiators in cold spots give off heat while those in warmer parts of the same room are automatically throttled down.

- **NO ELECTRICAL CONNECTIONS**

  No electric wiring, additional piping, or other connections are required with the Sterlco Thermotrol. Just as easily installed for modernization as for new construction.

FOR BUILDING MODERNIZATION

With a Sterlco Thermotrol on each radiator, stuffy overheated rooms, open windows, and excessive fuel bills are eliminated. You pay for only the heat you need . . . rooms are comfortably, evenly warm . . . occupants comfortable.

FOR NEW CONSTRUCTION

Here's modern ZONE CONTROL for radiant systems. The only modern solution to inefficient "on-off" valves and expensive, motorized valves.

STEAM HEATING IS MODERN, EFFICIENT and DEPENDABLE

Sterlco Products Distributed through

LEADING HEATING and PLUMBING WHOLESALERS

STERLING, INC.

3732 N. Holton St., Milwaukee 12, Wisconsin

CONDENSATION AND VACUUM PUMPS

HEATING SPECIALTIES

TEMPERATURE CONTROLS

WE HEAR THAT

Continued

beryards. *AMERICAN BLOWER CORP.* celebrated its 75th anniversary last month. After a modest beginning in Detroit in a building about 60 × 30 ft and with three workmen, the company has grown until today it has plants at Dearborn, Mich.; Columbus, Ohio; and San Leandro, Calif., and employs about 2300.

▸ The type of training necessary for the engineering profession and the engineer's role in planning the world of tomorrow are subjects of a new, nontechnical, color movie recently released by the College of Engineering of Ohio State University. The 20 minute sound film, "Engineering for Eddie," is designed to serve as a guide to today's youngsters and their parents in evaluating the educational requirements and practical applications of engineering training. The film is available on a free-loan basis or for purchase from the university.

▸ Because of its rise to success in less than 10 years — from a company of four people to one of the leaders in the design and manufacture of heating and air conditioning outlets — *TITUS MFG. CORP.* has been selected to appear on Quentin Reynolds' nationally distributed television show, "Operation Success." It is estimated that the 15 minute program will be viewed by 18 million people.

▸ Reorganization of the former *TORK CLOCK CO., INC.* into *TORK TIME CONTROLS, INC.* has been reported by the company. Along with the change in name to one more indicative of the company's products, Tork is expanding its research and engineering activities. Heading the roster of the new engineering staff is *JOHN H. BEIER.*

▸ *FLORI PIPE CO.* and *HOUSTON PIPE & STEEL CO.* now constitute the pipe fabricating operation of *SPARKS WITHINGTON CO.* Parent company of Flori Pipe, Sparks Withington has effected the unification by purchase of all the stock of Houston Pipe & Steel.

▸ *JAMES L. COLEMAN, JR.* has announced that the new mechanical contracting company which he recently formed has now become a Pennsylvania corporation under the name of *COLEMAN-GOOD, INC.*, with offices and facilities in Pittsburgh.

▸ *WALWORTH CO.* has acquired all the capital stock of *GROVE VALVE AND REGULATOR CO.* and *GROVE CONTROLS, INC.* Walworth issued 208,500 shares of its common stock in the purchase.

New! VULCAN LINO-TRIM
COMMERCIAL ENCLOSURE

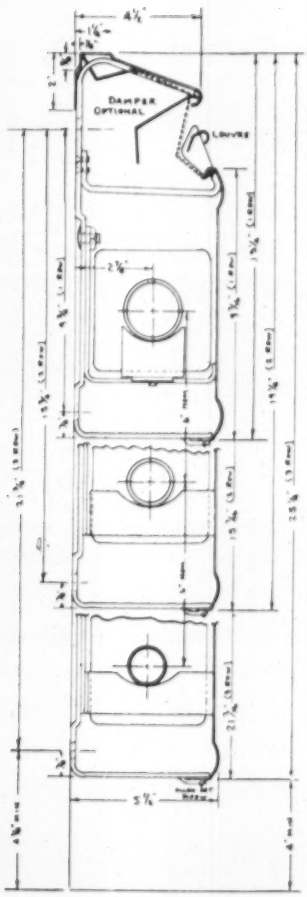
STYLED FOR BEAUTY
DESIGNED FOR HIGH OUTPUT

APPLICATIONS

The perfect choice for modern architecture, including schools, hospitals, churches and office buildings.

FEATURES AND ADVANTAGES

- Design simulates Vulcan's famous TRIMLINE Baseboard, particularly suited to modern and progressive architecture.
- Designed for high output, wide flexibility. Available in 1-, 2- and 3-high.
- Front easily removed for cleaning and access to piping. Top permanently anchored to wall with pre-formed caulking groove to prevent air leakage — eliminates periodic removal and subsequent damage to wall finish.
- Attractive, fixed louvre.
- Enclosure can be easily cut to length on the job.
- Permanently anchored, extra heavy steel support brackets hold cover rigidly, top and bottom.
- Full line of matching accessories.



Note: Available with Rigid or Slide Cradle Hangers. The same enclosure can be used with 3¼" and 4¼" fins.

SPECIFICATIONS

LENGTHS — Available in stock lengths up to 8' in 6" increments.

DAMPERS — furnished in same length as enclosures; packed separately and easily installed in field without screws. Snaps into place.

MATERIAL — 18 gage, zinc-coated, rust-resistant, bonderized steel. (16 gage also available.)

RATINGS

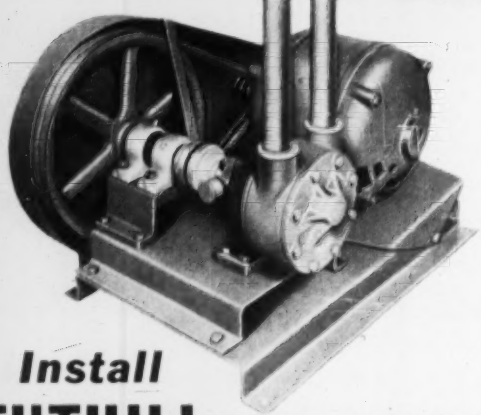
Complete ratings available. Write today for Catalog 625B.

THE VULCAN RADIATOR CO.

775 CAPITOL AVE., HARTFORD 6, CONN.

Originators of Fin-Tube and Baseboard Radiation in America

NEW FUEL PUMP UNIT Cuts Costs Two Ways



Install TUTHILL TYPE SU V-BELT Pumping Unit for Lower Original Cost and Reduced Maintenance

The new Tuthill Type SU multiple V-belt pumping units provide structural and performance advantages that save money and insure dependable, uninterrupted operation.

Features like these make the SU outstanding for handling heavy fuel oils in industrial and commercial heating:

- ★ **Double savings through low original cost and low maintenance cost.**
- ★ **One-point belt-tension adjustment.**
- ★ **Motor mounting provides for motors up to 7½ h.p.**
- ★ **Fabricated steel base with all bolts and adjustments readily accessible.**
- ★ **Handles 2 to 4 belts as required.**
- ★ **Standard pulleys for economy and prompt replaceability.**
- ★ **Pump, jack shaft and pillow blocks available as separate unit.**
- ★ **Wide range of capacities and pump models featuring lip-type shaft seal especially designed to eliminate leakage in handling heavy fuel oils.**

Write for new Bulletin No. 107

TUTHILL PUMP COMPANY
Dependable Rotary Pumps . . . since 1927
939 East 95th Street, Chicago 19, Illinois

Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario, Canada

WE HEAR THAT — *Continued*

▸ *GENERAL CONTROLS CO.* announces new and larger facilities in St. Louis, designed for servicing customers in that area.

▸ *HAYS CORP.* has expanded its engineering department facilities by increasing the experimental engineering work area. A new engineering annex recently completed has more than trebled the available work space for engineers and technicians, the company says.

▸ *EMERSON ELECTRIC MFG. CO.* has completed a new engineering building at its St. Louis plant and expanded its research and development program. The new, 40,000 sq ft, one-story structure will provide additional facilities for the engineering staff of Emerson's Electronics and Avionics Div. *EDWIN C. LOGAN* has been appointed director of the department of research.

▸ A new 3 acre manufacturing plant and home office for *MINNEAPOLIS-HONEYWELL REGULATOR CO.'s* valve division will be constructed at Fort Washington, Pa. The 120,000 sq ft building, representing a reported investment of more than $1.5 million, will house the entire manufacturing, sales, research, development and administrative facilities of the division, now located at Philadelphia.

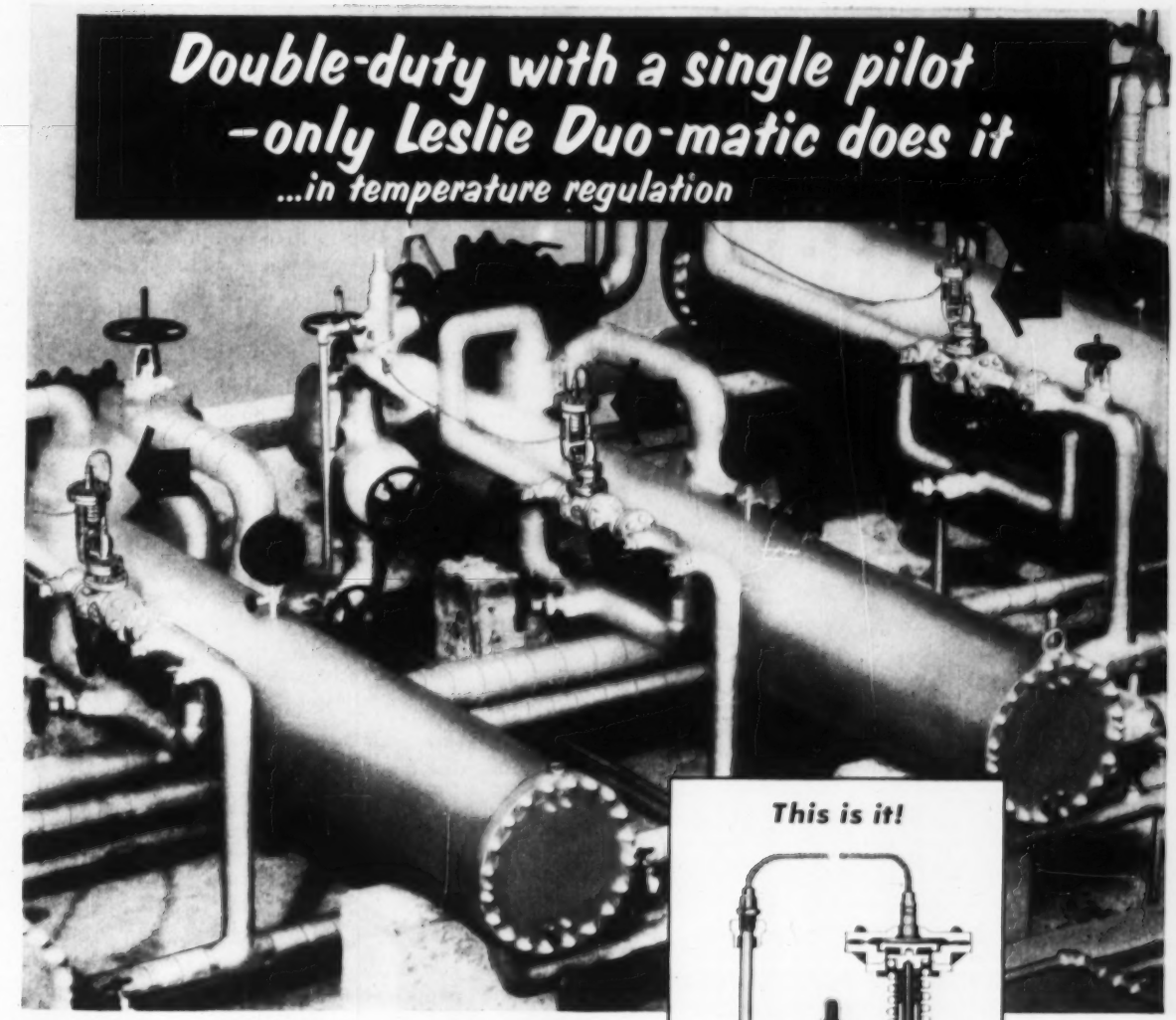
▸ *POWERS REGULATOR CO.* has started construction of a new $300,000 Chicago office-warehouse. The 16,000 sq ft building will house the company's sales offices. The facility is part of a long range plan to expand and improve services in major industrial centers, the company says. The split-level structure has 700 sq ft of air conditioned office space.

▸ Some 250 suppliers and customers as well as nearly 1000 employees, their wives, and families were guests of *LAU BLOWER CO.* at a two-day open house celebrating the completion and opening of a new $1.5 million plant addition in Dayton. The new plant is the biggest single addition in the company's history. Housing general offices, production facilities and the engineering department, the 57,200 sq ft structure adjoins present factory and space in Dayton.

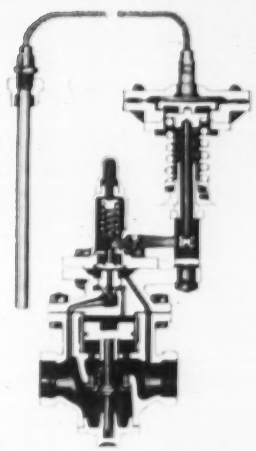
▸ *ORR & SEMBOWER, INC.'s* school for servicemen has recently completed its second year. The service school, a two-week session, is designed to provide capable factory schooled service people in all of the company's distribution centers. About 100 attended the sessions held this year and last, including students from Canada, Mexico, Chile, India and Australia. In

Double-duty with a single pilot —only Leslie Duo-matic does it

...in temperature regulation



This is it!



Leslie Class LTCO Duo-matic temperature and pressure regulator

The Duo-matic Leslie temperature regulator for controlling steam flow is a single unit, with a *single* internal pilot valve—yet it controls automatically both temperature and pressure conditions. No hunting or cycling on low flows . . . eliminates temperature "droop" on heavy loads.

Simplified piping and better control of fuel oil heaters, instantaneous and storage type heaters, driers, process heaters, kettles, open tanks, ovens, degreasing machines, steam tables, sterilizers, etc., more than offset the initial cost of this superior regulator.

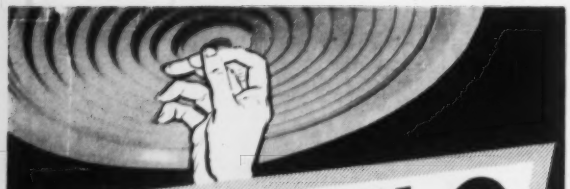
Investigate "dual-function" Duo-matic regulators — proven in service for over 19 years of applications.

Write for Bulletin 5307

TRADE LESLIE MARK

REGULATORS AND CONTROLLERS

LESLIE CO., 237 GRANT AVENUE, LYNDHURST, NEW JERSEY



FLEXIFLO

The Diffuser for Every Application

Here's the complete diffuser line with all extra features: built-in equalizing deflectors; easy to install; quick adjustment of air volume and diffusion pattern; simplified engineering; beautifully finished in any color baked enamel.

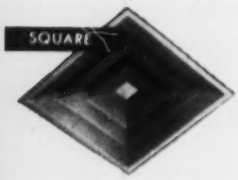
Let our sales engineers show you why Flexiflo is better for your jobs. But first — get the Flexiflo catalog.

Type R, constant flow pattern regardless of volume adjustment.

Type V, fully adjustable air diffusion pattern and volume.

Type MP, for 1-, 2-, 3- or 4-way diffusion to accommodate any shaped area, 16 styles.

Type CH, adjustable for heating, ventilating and cooling.



Type H, adjustable volume, constant pattern and radius of diffusion.

Type S, side wall or ceiling, with Type R or V blades for heating or cooling.

Return this coupon

UNIVERSAL DIFFUSER CORP.
38 Marbledale Road, Tuckahoe, N. Y.

Please send me complete catalog HP

NAME_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

WE HEAR THAT

Continued

addition, more than a score have taken one-week refresher courses offered earlier this year.

▸ *KAISER ALUMINUM & CHEMICAL CORP.* is acquiring the *HOKIN ALUMINUM CO.* extrusion plant located at Dolton, Ill. Kaiser intends to operate the plant with present personnel and continue service without interruption.

▸ *E. I. du PONT de NEMOURS AND CO.* has created a new department, Elastomer Chemicals, to be responsible for research, production and sales for all products currently handled by the Elastomers Div. of the company's Organic Chemicals Dept.

▸ Over 250 *GENERAL ELECTRIC CO.* dealers and their wives throughout the country have earned a week's holiday trip to Paris as a result of increased sales of packaged air conditioning units during 1956, the company reports.

▸ Building problems arising from the extensive use of windows and glass in contemporary architecture were examined at a conference held during November at the U.S. Chamber of Commerce in Washington, D.C. The conference was sponsored by manufacturers of glass products, windows and accessory devices, and their affiliated trade associations.

▸ *CRANE CO.*'s heating school recently began its seventh year at Evanston, Ill. During the school year 220 Crane salesmen and wholesalers' representatives from across the nation will attend classes, Crane reports.

▸ At a special ceremony attended by its 1000 Milwaukee employees, *INLAND STEEL PRODUCTS CO.* received four awards for outstanding accomplishments in industrial safety. The firm's employees have, for the third time in five years, attained a record of 1.5 million man hours without a lost time accident.

▸ Expansion of facilities for the production of "Supervisory DataCenter" temperature panels for commercial buildings is reported by *MINNEAPOLIS-HONEYWELL REGULATOR CO.* A $150,000 addition will be made to link two Minneapolis buildings leased by Honeywell for design, engineering and fabrication.

▸ Activities of the *NATIONAL COAL ASSOCIATION* are now being carried out under the name of *BITUMINOUS COAL INSTITUTE*. The change in name is a move whereby the institute will carry out

Precision Temperature Control at Your Command . . .

Klipfel GOLDEN GENIE

Self-Actuated Vapor Pressure TEMPERATURE REGULATOR

Modern design and skilled craftsmanship are combined in the new Klipfel Golden Genie to assure accurate, positive, low cost temperature control.

Featuring strong, long-lasting 2-ply bellows, it operates at higher working pressure with smaller bulb, develops more power for valve actuation.

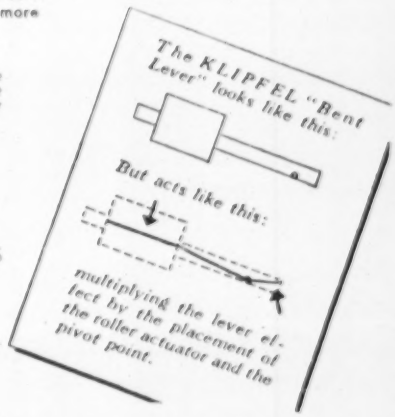
Let Klipfel experience go to work for you. Write for full details on the new Golden Genie and the complete Klipfel line.

Klipfel "Bent Lever" REDUCING VALVE

It is the function of all reducing valves to increase or decrease the supply so as to maintain a constant reduced pressure when an increase or decrease in demand tends to lower or raise it.

The pilot tube control and the "Bent Lever" action found in the KLIPFEL No. 310 Reducing Valve insure more prompt response to demand changes and more uniform reduced pressures.

These features are a sample of the engineering that goes to make KLIPFEL Reducing Valves and other automatic regulating valves more dependable—more accurate in regulation. Write Dept. C-12 for your copy of Bulletin 154, which describes Klipfel Reducing Valves.


The KLIPFEL "Bent Lever" looks like this:
But acts like this:
multiplying the lever effect by the placement of the roller actuator and the pivot point.

Klipfel

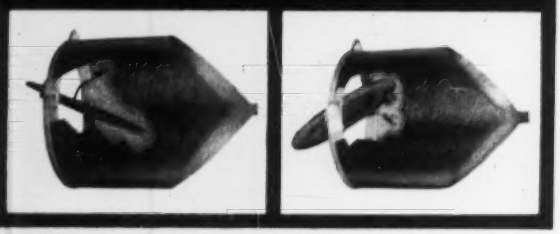
FLOAT VALVES
REDUCING VALVES
TANK THERMOSTATS
BACK PRESSURE VALVES

Sold through wholesalers everywhere

VALVES, INC.

DIVISION of HAMILTON-THOMAS Corp.
HAMILTON, OHIO
Export Dept. 1010 Schaff Bldg., Philadelphia, Pa.

WALKER BBG
DOUBLE SWING CONTROL
Regulates **UPDRAFT**
Dispels **DOWNDRAFT**
in **GAS-FIRED** combustion equipment!



UPDRAFT—The Double Swing Vane opens INWARDLY for NORMAL UPDRAFT operation. The highly sensitive adjustment weight assembly operates by smooth pivot action, maintains precise draft regulation under all stack draft variations. Automatic fluctuation of vane keeps draft uniform for highest combustion efficiency. All parts are corrosion-resistant. Long, heavy-gauge collar holds control safely out of flue gas stream.

DOWNDRAFT—Vane here is shown swung OUTWARDLY for DOWNDRAFT relief. When downdraft occurs, vane first swings to vertical position at which instant the weight of adjustment assembly is automatically transferred to the relief bar and damper comes into perfect balance. Internal pressure in the breeching causes vane to swing out, relieving the backdraft pressure before it affects burner operation. Entire unit is perfectly balanced, pre-adjusted at factory.

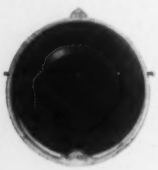
New Walker Double Swing Control Delivers Two-way Performance for Better Efficiency, Greater Safety!

By preventing excessive draft and at the same time guarding against backdraft, the Walker Double Swing Control both increases efficiency and adds to the safe operation of gas-fired combustion equipment. As an extra safety feature, Walker offers an optional safety switch and relay. Prolonged downdraft causes flashing warning signal and eventual cut off of burner. Approved by Underwriters Laboratories, the Model BBG is another example of Walker's progressive design and superior engineering.

Look to Walker
FOR A COMPLETE LINE OF DRAFT CONTROL PRODUCTS

Walker, with over 30 years of draft control experience, produces automatic regulators for a complete range of installations . . . from small space heaters to the largest heating plants in factories and multiple housing projects. For complete information on any of the complete line of Walker products, see your supplier or write directly to the factory.

Walker SHUR-FLO Draft Inducer-Regulator
New! Both inspirates and regulates. Corrects most difficulties caused by insufficient draft!



Walker BB
For all commercial and industrial draft control applications.

Walker Royal Purple Model
The only automatic draft control that's absolutely impregnable to soot, carbon, corrosion, dust, dirt.

Get the Facts and You'll Get Walker!
See Your Supplier or Write:

WALKER MANUFACTURING & SALES CORP.

1720 PENN ST. ST. JOSEPH, MO.

WE HEAR THAT — *Continued*

its program on a national scale "to encourage the increased use of bituminous coal and improve coal's competitive position."

▸ A western welcome was accorded by Las Vegas to one of the planes bearing 329 dealer and distributor guests of *WESTINGHOUSE ELECTRIC CORP.'s* packaged air conditioning division. They won their holiday by participation in a three month "sales rodeo."

▸ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.* has opened a new mill depot in Dayton. Designed to better serve wholesaler customers, the facility will stock copper water tube, refrigeration tube and automotive tube.

▸ *REFRIGERATION ENGINEERING, INC.* was recently recognized for outstanding community leadership when it was awarded the Community Chest's Bronze Plaque. By exceeding their quota for 1956 before the overall solicitation got underway, the company was named as a "pace-setter."

▸ A discussion and practical demonstration of gun type oil burners by *N. H. RICHFIELD* was a highlight of the 11th annual convention of the New England States Association of *REFRIGERATION SERVICE ENGINEERS SOCIETY* held in Boston recently. Mr. Richfield is manager of accessories, burners and controls for the plumbing and heating division of *AMERICAN RADIATOR & STANDARD SANITARY CORP.*

▸ *BLACK & DECKER MFG. CO.* was judged the company with the best annual report in the portable electric tool industry in the 16th annual survey of *Financial World* magazine. The bronze "Oscar of Industry" was presented at an awards banquet.

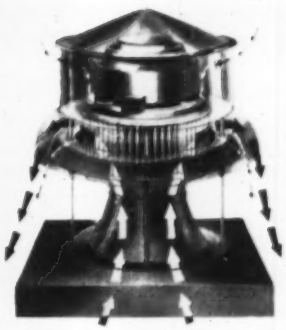
▸ Two new "learn while you earn" programs providing the opportunity and financial assistance for employees to work toward college degrees while holding full-time jobs have been announced by *CARRIER CORP.* One of the programs, set up in cooperation with Syracuse University, offers a series of evening classes enabling high school graduates with the necessary college admission background to complete their freshman and sophomore years in engineering over a period of four years. Carrier pays 75 percent of all student costs. The other is a "Tuition Refund Plan" under which the company will pay 75 percent of costs for any job-related courses. Under this plan an employee may also secure education in nonengineering fields related to his job. ≠

A New Polymer Research Laboratory
at The Dow Chemical Company
Midland, Michigan

38 Gallaher Air-Vans®

handle tough ventilation problems quietly at

The Dow Chemical Co.



Capacities
150 CFM to 65,000 CFM.
Static pressure to 4".

Exhausting corrosive chemical fumes is a job for highly efficient and rugged power roof exhausters. No others need apply. When this chemical company purchased Air-Vans for its new Polymer Research Laboratory, it did so with the knowledge that Air-Vans would do the job.

Why did they specify Gallaher? First, research is exacting and demanding . . . Air-Vans ventilated the laboratories efficiently and quietly. Secondly, research is lengthy and tedious . . . Gallaher Air-Vans could be counted on day and night over the long haul.

If you are looking for new economy and efficiency in power roof exhausters, it will pay to investigate the Air-Van's many features—patented scroll design, patented protective air seal-offs, low silhouette, quiet operation, availabilities in special metals, service everywhere, and shipment completely assembled.

For full information write . . .

Pioneers in Research-designed power roof exhausters

The GALLAHER Company

4108 Dodge Street Omaha, Nebraska

Export Office: 306 Paul Bldg., Utica 2, N. Y. Cable "Keiserquip"

We're SPECIALISTS in Air Conditioning SUPPLIES and PARTS

In this new DEPENDABOOK you'll find over 10,000 items — the LARGEST Selection in the World!

WHOLESALE ONLY
We sell you—not your customers. And we sell you at lower prices. You select from a complete stock illustrated, described and priced in the DEPENDABOOK — "the standard of the trade." Your orders —for air conditioning and electric motor parts and supplies — are filled quickly and accurately.

ORDER BY MAIL
or visit our well-stocked warehouses. Don't delay. Get the Harry Alter DEPENDABOOK by return mail.

Write on your letterhead to

The HARRY ALTER CO., Inc.
1717 S. Wabash Avenue, Dept. H, Chicago 16, Illinois
Branches in New York, Dallas, Atlanta

MEETINGS & CONVENTIONS

1957

JAN. 21-22—*Today's Tool for Tomorrow's Research*, symposium on solar furnace design and operation. Hotel Westward Ho, Phoenix. Sponsored by the Association for Applied Solar Energy, in conjunction with Stanford Research Institute, Arizona State College at Tempe and University of Arizona. Information: John I. Yellott, secretary of the association, 3424 N. Central Ave., Phoenix.

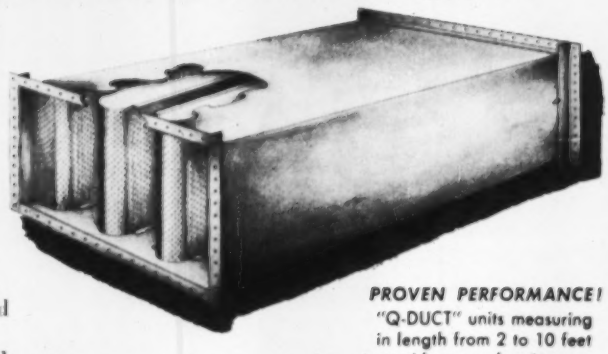
JAN. 23-25—*Instrumentation for the Process Industries*, 12th annual symposium. Texas A & M College. Information: Dr. C. D. Holland, Dept. of Chemical Engineering, Texas A & M College, College Station, Tex.

JAN. 28-31—*Eighth National Plant Maintenance & Engineering Show*. Public Auditorium, Cleveland. Information: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

FEB. 4-8—*American Society for Testing Materials*, committee week. Benjamin Franklin Hotel, Philadel-

IAC offers packaged "STANDARDIZED SILENCING" with Q-DUCT

The Silencing System
That Quiets Air-Conditioning
and Ventilating Systems
. . . IN THE DESIGN STAGE!



PROVEN PERFORMANCE!
"Q-DUCT" units measuring in length from 2 to 10 feet provide as much noise control as a conventional lined duct measuring from 30 to 100 feet long!

Packaged *Q-DUCT* units, *standardized* for easy installation, are available to eliminate duct noises from existing installations, or can be fitted into the system during the design stage!

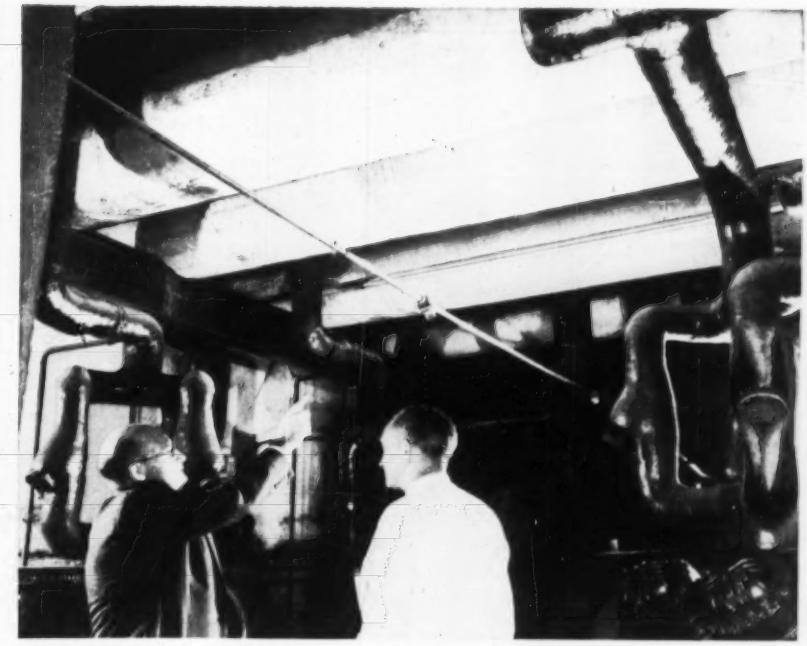
Made in *148* sizes to meet every dimension and performance, *Q-DUCT* units take the guess-work out of the acoustic design of air-conditioning and ventilating systems.

The attenuation and pressure drop data of every *Q-DUCT* unit, having been determined by actual controlled measurements, are readily available from handy data sheets!

Write on business letterhead for Q-Duct catalog and complete data!

IAC — Your Standard of Silence

INDUSTRIAL ACOUSTICS COMPANY, INC.
"Specialists in Noise and Pulsation Control"
341 Jackson Avenue, New York 54, N.Y. Tel: CYpress 2-0180

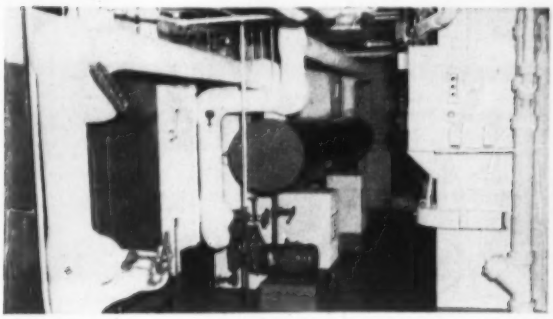


"They've never given us a lot of trouble," states Mr. R. E. Noll (left), Store Superintendent. With him is Mr. J. L. Quisenberry, Head of Maintenance for Wolf & Dessauer, who was with the store when the eight Dry-Ex units were installed in 1937. The system, including eight 50 hp condensing units and 15 remote air handling units, air conditions the main building's seven floors. The system was installed by Hipskind Heating and Plumbing Company of Ft. Wayne.

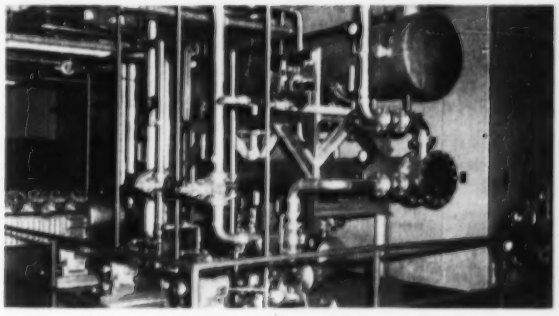
19 YEARS OF TROUBLE-FREE SERVICE

First *Acme* Dry-Ex® Chillers still in operation in famous Indiana department store

Operating with full capacity and efficiency since 1937, eight Acme Dry-Ex Chillers in the Wolf & Dessauer department store, Ft. Wayne, Indiana have never required any maintenance other than routine cleaning. As a result, in almost 20 years of operation, this busy store has never lost a day's air conditioning through interruption of service by these Acme units.



MODERN DRY-EX CHILLERS do all kinds of air conditioning, refrigeration and industrial, direct-cooling jobs. This Dry-Ex air conditions the Anderson Loan Association building at Anderson, Ind. The 50-ton system also utilizes an Acme evaporative condenser.



100-TON DRY-EX AND ACME FREON CONDENSER are major components of this Cincinnati, Ohio air conditioning installation in Western & Southern Life Insurance Company's modern office building. Two Acme Flow-Mizer® cooling towers allow constant re-use of condenser water.

The modern Dry-Ex combines the dependability of Acme's thru-tube construction, proven in 19 years of broad field experience, with the added efficiency of an exclusive star-insert tubing. You receive more chilling capacity per dollar of investment than ever before.

Acme custom builds Dry-Ex Chillers, utilizing standardized parts, to meet exactly the conditions of virtually any water chilling or other liquid cooling application. Capacities from 5 to 400 tons are available in single or multi-circuit units. Two model series, one with star-insert tubing and the other with plain tubing, are available. A wide range of baffle and head pass combinations make it possible to achieve ideal, controlled liquid velocities.

To Get Your Copy of Acme's data-packed Dry-Ex catalog, just send us this coupon attached to your letterhead

ACME AIR CONDITIONING REFRIGERATION

Acme INDUSTRIES INC., Jackson, Michigan

Dry-Ex Liquid Chillers · Liquid Receivers · Heat Exchangers · Condensers · Packaged Chillers · Packaged Heat Pumps · Evaporative Condensers & Cooling Towers · Room Conditioners

Manufacturers of Quality Air Conditioning and Refrigeration Equipment since 1919

MEETINGS & CONVENTIONS — *Continued*

1957

phia. ASTM headquarters: 1916 Race St., Philadelphia 3.

FEB. 5-7—12th SPI Reinforced Plastics Division Conference. Edgewater Beach Hotel, Chicago. Society of the Plastics Industry, Inc., 250 Park Ave., New York 17.

(*Air Conditioning, Ventilating and Electric Space Heating Exposition*, previously announced on these pages as being scheduled for February 8-10 at Washington, D.C., has been cancelled, according to an announcement from the Electric Institute of Washington.)

FEB. 18-21—Sixth Annual Industrial Ventilation Conference. Kellogg Center, Michigan State University. Information: Industrial Ventilation Conference, Continuing Education Service, Michigan State University, East Lansing, Mich.

FEB. 25-28—American Society of Heating and Air-Conditioning Engineers, Inc., 63rd annual meeting. Conrad Hilton Hotel, Chicago. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth

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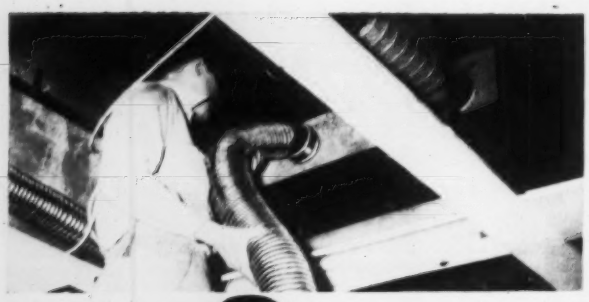

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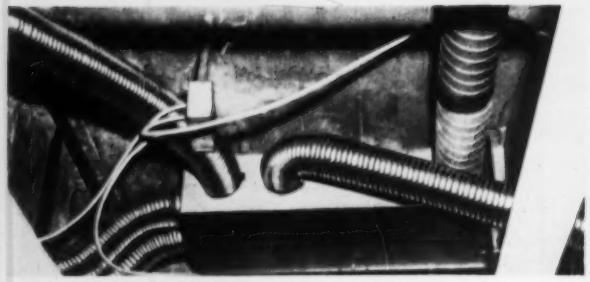

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MEETINGS & CONVENTIONS

Continued

1957

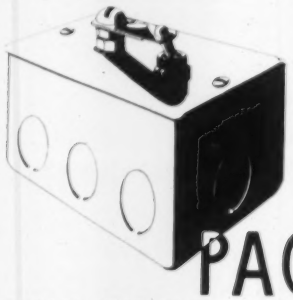
St., New York 13. (The meeting program appears on page 126 of this issue.)

FEB. 25-MARCH 1—13th International Heating and Air-Conditioning Exposition. International Amphitheater, Chicago. Under management of International Exposition Co., 480 Lexington Ave., New York.

MARCH 11-15—National Association of Corrosion Engineers, annual conference and exhibition. Kiel Auditorium, St. Louis. NACE headquarters: 1061 M&M Bldg., Houston 2.

MARCH 18-21—Society of the Plastics Industry, annual national conference and Pacific Coast plastics exposition. Hotel Biltmore and Shrine Exposition Hall, Los Angeles. SPI headquarters: 250 Park Ave., New York 17.

MARCH 27-29—19th Annual American Power Conference. Hotel Sherman, Chicago. Information: Illinois Institute of Technology, 35 W. 33rd St., Chicago.



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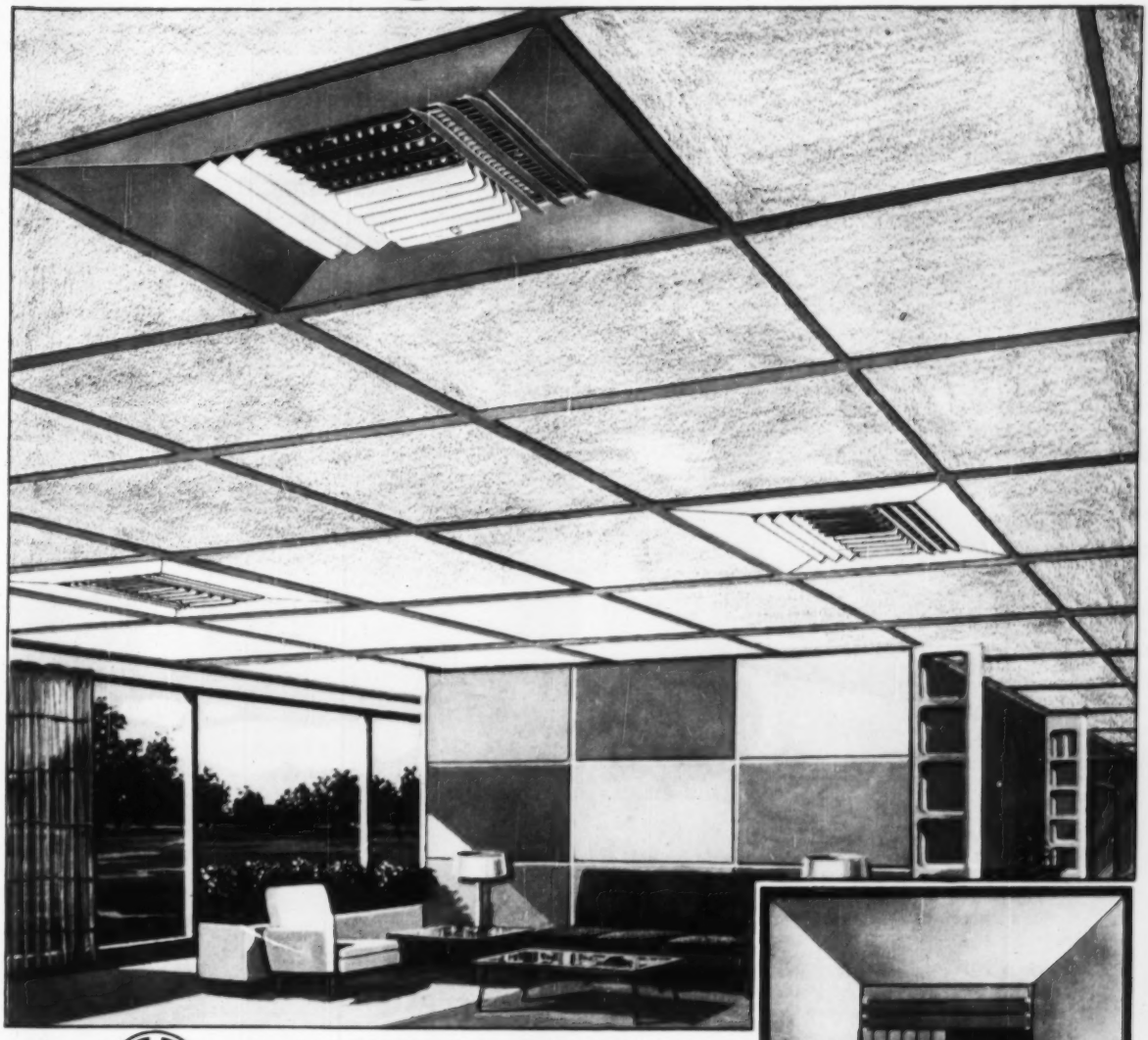

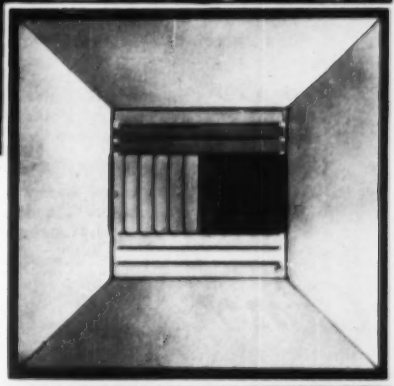

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MEETINGS & CONVENTIONS *Continued*

1957

APRIL 14-17—*Building Research Institute*, annual meeting. Edgewater Beach Hotel, Chicago. BRI headquarters: 2101 Constitution Ave., Washington 25, D.C.

APRIL 14-27—*United States World Trade Fair*. Coliseum, New York. Information: United States World Trade Fair, 331 Madison Ave., New York.

MAY 6-8—*Air-Conditioning and Refrigeration Institute*, annual meeting. The Homestead, Hot Springs, Va. ARI headquarters: 1346 Connecticut Ave., N.W., Washington 6, D.C.

MAY 7-10—*Mechanical Contractors Association of America*, annual meeting. Hotel Fontainebleau, Miami Beach. The association is at 30 Rockefeller Plaza, New York 20.

MAY 20-24—*National Fire Protection Association*, annual meeting. Hotel Statler, Los Angeles. NFPA headquarters: 60 Batterymarch St., Boston.

JUNE 2-5—*American Society of Refrigerating Engineers*, annual meeting. Hotel Fontainebleau, Miami Beach. ASRE headquarters: 234 Fifth Ave., New York.

JUNE 3-6—*National District Heating Association*, 44th annual meeting. The Homestead, Hot Springs, Va. Information: John F. Collins, Jr., secretary-treasurer, NDHA, 827 N. Euclid Ave., Pittsburgh.

JUNE 16-21—*American Society for Testing Materials*. Chalfonte-Haddon Hall, Atlantic City. ASTM headquarters: 1916 Race St., Philadelphia 3.

JUNE 24-27—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semi-annual meeting. Murray Bay, Quebec. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth St. New York 13.

AUG. 11-15—*First National Conference on Applied Heat Transfer*. Pennsylvania State University, University Park, Pa. Sponsored by heat transfer division and central Pennsylvania section of American Society of Mechanical Engineers in cooperation with College of Engineering and Architecture of the University. ASME headquarters: 29 W. 39th St., New York 18.

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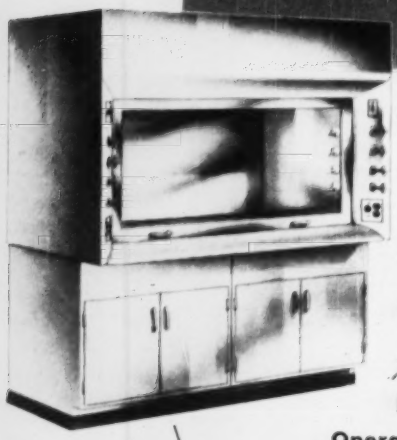

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MEETINGS & CONVENTIONS — *Continued*

1957

OCT. 7-9—American Gas Association, annual convention. Kiel Auditorium, St. Louis. AGA headquarters: 420 Lexington Ave., New York 17.

OCT. 21-25—45th National Safety Congress & Exposition. Chicago. National Safety Council, 425 N. Michigan Ave., Chicago 11.

NOV. 14-16—American Society of Refrigerating Engineers, semi-annual meeting. Morrison Hotel, Chicago. ASRE headquarters: 234 Fifth Ave., New York.

NOV. 18-21—10th Exposition of the Air-Conditioning and Refrigeration Industry. International Amphitheater, Chicago. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D.C.

NOV. 18-22—National Warm Air Heating and Air Conditioning Association, committee meetings and annual convention. Morrison Hotel, Chicago. NWAHACA headquarters: 640 Engineers Building, Cleveland 14.

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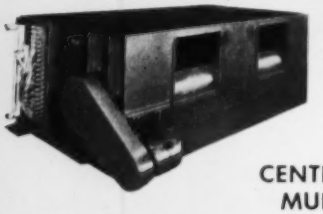

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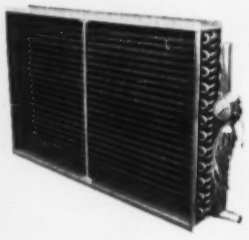

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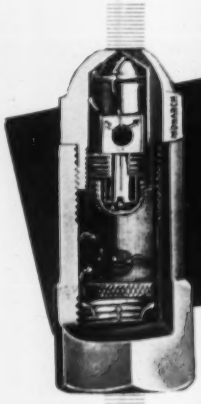

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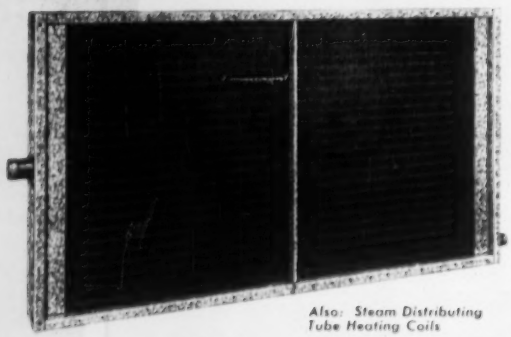

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SELECTED ASTM ENGINEERING MATERIALS STANDARDS—370 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $4.00 ($1.50 to students in recognized engineering colleges).

APPLIED ELECTRICAL MEASUREMENTS—By Isaac F. Kinnard, with 14 contributors. 600 pp. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. $15.00.

ENCYCLOPEDIA OF AMERICAN ASSOCIATIONS—Gale Research Co., 421 Book Tower, Detroit 26. $15.00.

NATIONAL FIRE CODES—1956 Ed. Six volumes cover flammable liquids and gases; combustible solids, dusts, chemicals and explosives; building construction and equipment; extinguishing equipment; electrical; transportation and miscellaneous. 4400 pp. Publications Dept., National Fire Protection Associ-

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SELECTED BIBLIOGRAPHY ON BUILDING CONSTRUCTION AND MAINTENANCE—Building materials and structures report 140 (Second Ed.). 40 pp. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. 30c.

SCHOOL PLANNING AND BUILDING HANDBOOK—By N. L. Engelhardt, N. L. Engelhardt, Jr., and Stanton Leggett. 626 pp. F. W. Dodge Corp., 119 W. 40th St., New York 18. $12.75.

REDWOOD LUMBER SPECIFICATIONS FOR APPLICATION IN INDUSTRIAL WATER-COOLING TOWERS—5 pp. In two parts: CTI grades of redwood lumber; framework design data. Bulletin STD-103. Cooling Tower Institute, 446 Emerson St., Palo Alto, Calif. $1.00.

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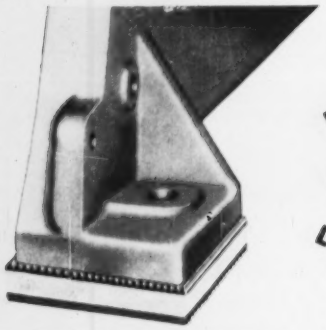

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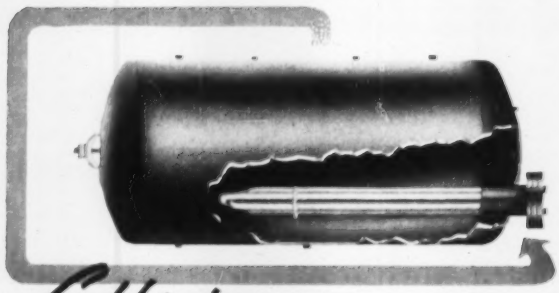

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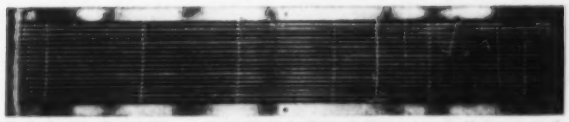

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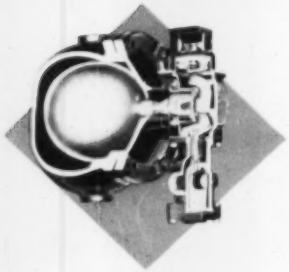

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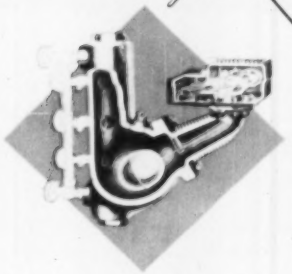

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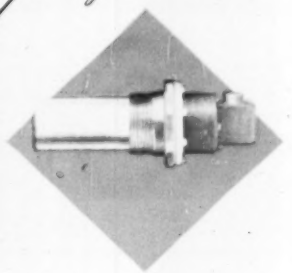

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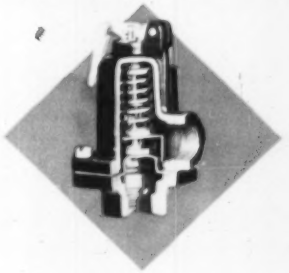

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